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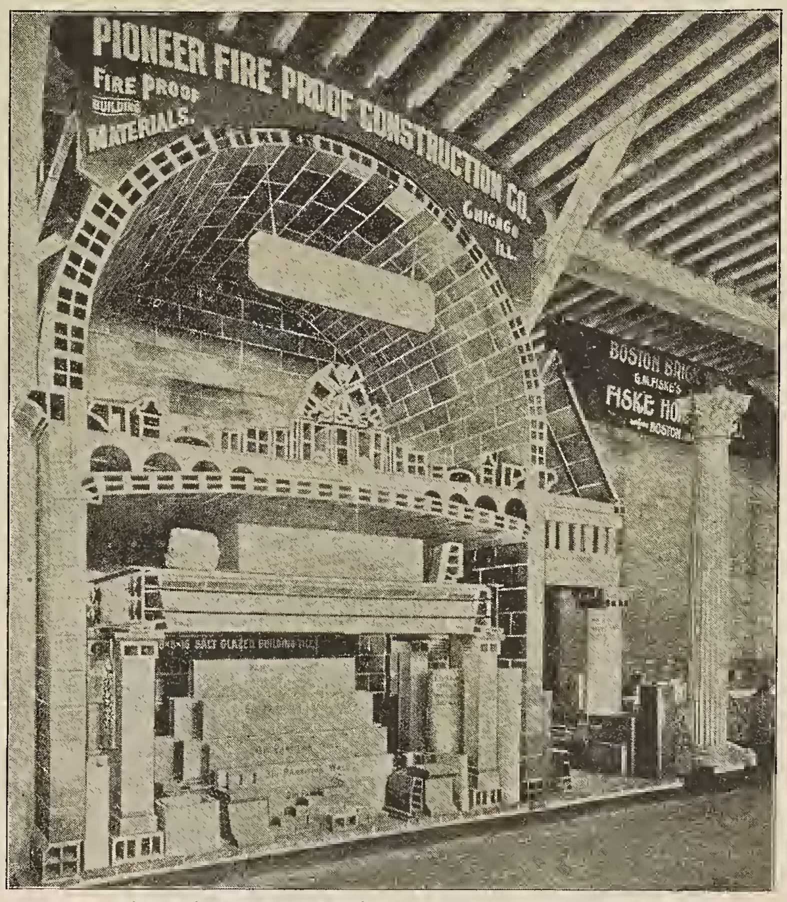

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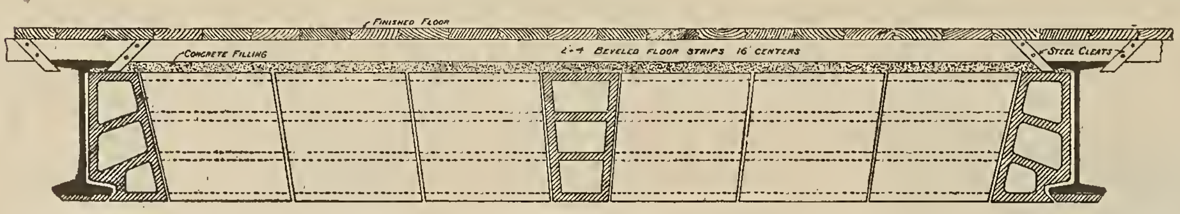

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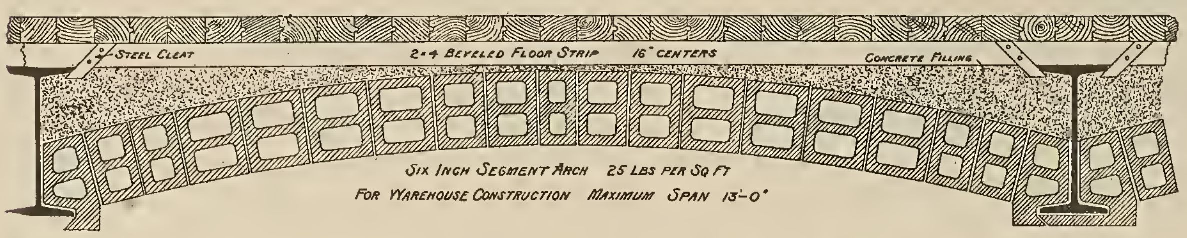

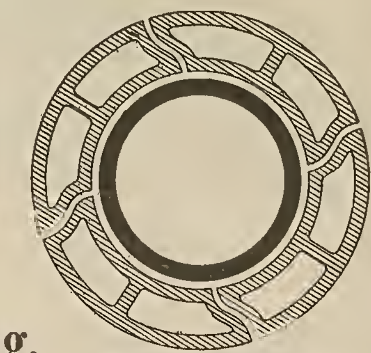

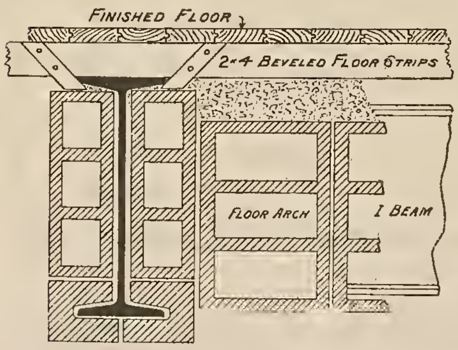

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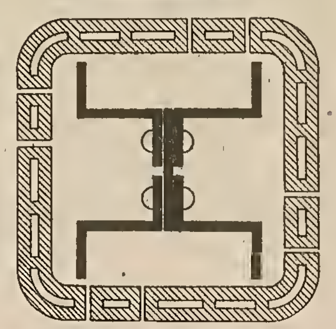

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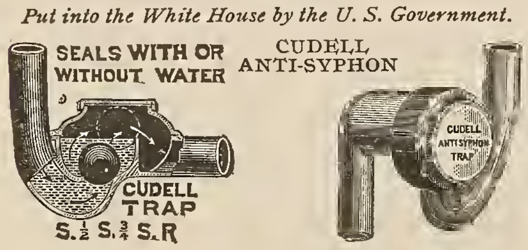

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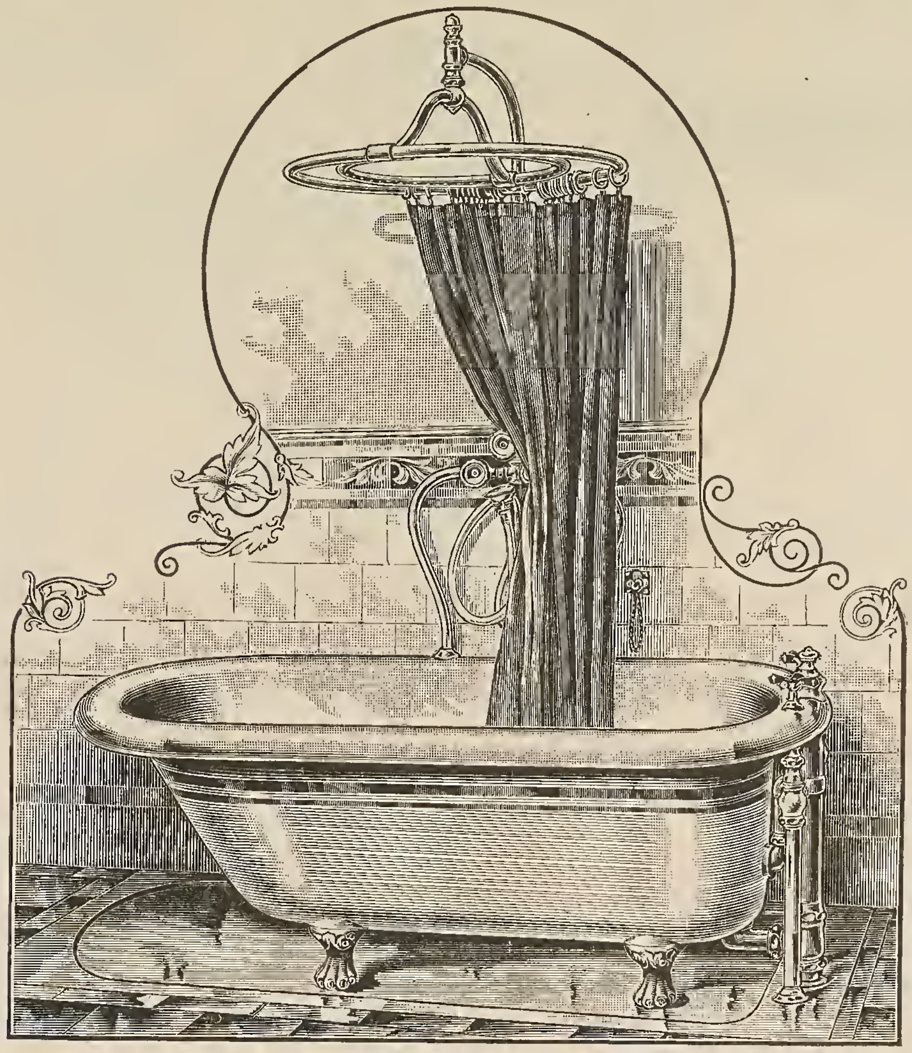

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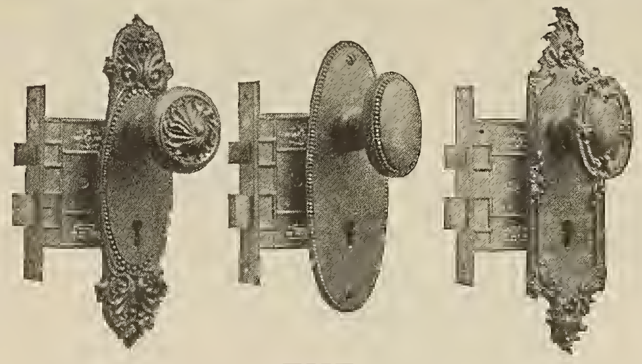

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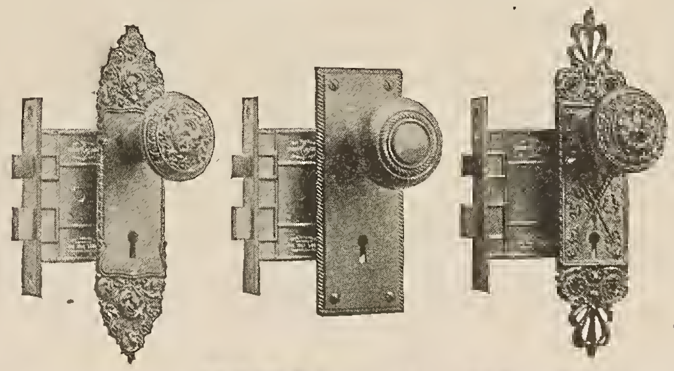

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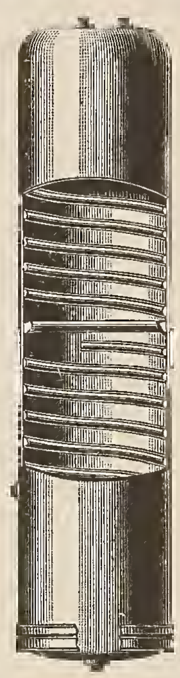

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The Inland Architect and News Record

Vol. XXX. JANUARY, 1898. No. 6

A Monthly Journal Devoted to

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CONSTRUCTION, DECORATION AND FURNISHING

IN THE WEST.

PUBLISHED BY THE INLAND PUBLISHING CO.,

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The columns and illustration pages of THE INLAND ARCHITECT are open to all alike, merit and availability only determining what shall be published. Contributions appropriate to its pages are always desired.

A Competition in Decorative Design. On another page we print the details of an attractive and unique competition offered architects and draftsmen, the prizes of which amount to $5,000. The programme is well arranged to give scope to the artistic and practical abilities of designers.

The University of California Competition Programme. In a previous issue we called attention to the competition announced by the trustees for the University of California, and intimated that its success or failure depended upon the programme. This has since been published and is given in full on another page. This grand competition, which in its scope and possibilities reminds one of the great competitions of the past, shows a remarkable weakness at the outset. Among the five judges of the preliminary competition only one name, that of Norman Shaw, can in any way be called national. The two American architects are unknown outside their own cities. The failure to state even approximately the sum that may be expended on the buildings is an error which will lead to future misunderstanding, and there are other errors of lesser note. A council composed of the greatest English, French, German and American architects should have been employed to draft the competition programme, and the judges should have been selected from among the past masters of architecture and not from the rank and file. We do not wish to be understood to in any way discourage the project. The trustees give every evidence of trying to carry out their great trust and purpose upon a broad and equitable basis, but we cannot refrain from pointing out at the outset what will become all too obvious as the competition progresses. It is hoped that the greatness of the project and the undoubted fairness of the proposed adjudication will attract the greatest minds in the profession, and that American architects especially will endeavor to place on the Pacific slope an enduring expression of all that American genius has evolved, so that the traveler can say here American architectural art has found its fullest expression. There is certainly the making or failure of a magnificent conception in the project presented by the Phebe A. Hearst University of California memorial.

A General Contract for Government Buildings. Secretary of the Treasury Gage has made it plain that he does not approve of letting contracts for government buildings separately, but that the public will be best served by letting the entire contract at one time and thus abolish the practice of making appropriations for buildings by degrees or as the work progresses. In making one contractor responsible for the entire work the chance of inferior material and workmanship is greatly reduced, and all speculating in contracts abolished. There are, however, some contracts which should be kept separate, such as the plumbing, heating, elevators, etc., as these can be handled best and inspected by skilled superintendents appointed for that special purpose. Although but a year has passed since Mr. Gage, as head of the government architectural department, began his radical change in building methods, the advance has been phenomenal and all in the line of better business methods. In fact, the Secretary of the Treasury looks upon the construction of government buildings as a business man, and each departure that has been made has been in the direction of placing the Supervising Architect's office upon a business basis, whereas in the past its political aspect was most dominant.

STEEL SKELETON CONSTRUCTION IN CHICAGO.*

BY EDWARD CLAPP SHANKLAND, M. INST., C.E.

THE main commercial district of Chicago, containing the municipal, county and government buildings, and the large offices, warehouses, hotels and theaters, occupies only three-fourths of a square mile. This is a very small area, compared with the 186.4 square miles within the city limits. It is bounded on the north and west by the Chicago river, on the south by the network of railways extending to Polk street, and on the east by Lake Michigan. These natural and artificial boundaries form obstacles to its enlargement, and the erection of many-storied buildings has become necessary in order to accommodate the great and constantly increasing demands of trade.

High buildings having become a necessity, a difficult problem was at once confronted. The soil consists of loam, and is principally made ground, to a depth of 12 or 14 feet, about city datum—the mean level of the lake in 1844. Below this there is a layer of blue clay, called "hard pan," between 6 and 10 feet in thickness, overlying a very soft and saturated clay, which becomes harder again at a depth of 50 or 60 feet. The latter sometimes contains sand and mud pockets, but is, for the most part, of the same nature as the hard pan, and saturated for a considerable distance below the lake level. Rock is found at a depth of between 60 and 80 feet. It was found by trial that the load upon the hard pan should not exceed 4,000 pounds, and should preferably be between 3,000 and 3,500 pounds per square foot. With such loads the buildings settle between 6 and 12 inches. Under the old masonry buildings, however, owing to their heavy walls and the small area of their foundations, the pressure has been found to reach 11,200 pounds per square foot; that method of construction was therefore rendered impossible. The settlement of these old buildings was much greater than that of the recent structures, but being constructed of wood and brick or stone they would admit of great distortion. They were built immediately after the great fire of 1871, shortly after which the level of the whole of this district was raised four feet. For several years steps occurred in the footway, perhaps at several places in the same block of buildings, and at such times a few inches of settlement in a building would not be noticed. By using thin outside walls of brick and terra cotta, or terra cotta alone, simply as a cover for the steel frames, and by spreading the foundations, the pressure on the clay has been greatly reduced, so that the four and five story buildings now standing exert a greater pressure on the clay than do the more recently constructed high buildings.

HISTORICAL.

The Montauk block, ten stories high, built in 1881 and 1882 from the designs of Messrs. Burnham & Root, was the first of the high buildings. Railway rails were inserted in the walls under the vaults, and this was the first occasion on which an iron and concrete footing was used. The masonry footings nearly filled the basement in the old buildings, and iron and concrete footings were used to give space in the basement for the boilers, engines and dynamos. In 1883 and 1884, the Home Insurance building, ten stories high, was built from the designs of Mr. W. L. B. Jenney. It was the first house in which the skeleton construction was adopted, consisting of cast-iron columns and wrought-iron floor beams. The Rookery, eleven stories high, designed by Messrs. Burnham & Root, was erected in 1885 and 1886 with isolated footings, but with solid masonry walls; and the Tacoma building, fourteen stories high, by Messrs. Holabird & Roche, architects, a more complete type of the skeleton construction than any of the preceding followed; after which the system came into general use.

SUPERSTRUCTURE.

Before the frame of the superstructure can be designed, the positions of the columns must be determined; the architectural considerations being considered as far as is consistent with safe design of the steel frame. A framing plan of the roof, attic and each floor is then made, and the floor area supported on each joist, girder and column is computed.

The live load, consisting of the weight of the tenants, the furniture and the partitions, which are frequently changed, is taken between 60 and 75 pounds per square foot for the upper floors of an office building, and between 75 and 100 pounds per square foot for the first and second floors, which are generally used for shops and banks. The weight of the tenants and furniture of a typical office has been found by experiment to be only 6 or 7 pounds per square foot; it certainly does not exceed 12 pounds. The average weight of the partitions is 25 pounds per square foot of floor. The dead weights of the roof and floor are also calculated.

A statement is prepared, showing the live and dead floor loads, the weights of the outside walls, the lift loads, the weights of the lift and house tanks, and of the water-closet floors, window frames, glass, mullions, etc., supported on each column at each floor. The live load, except the partition load, being deducted, the remainder is used in designing the foundations. The sum of these items gives the total weight of the building.

The unit stresses commonly employed are 16,000 pounds per square inch for fiber stress in steel I-beams, 15,000 pounds per square inch for plate girders, and 15,000 pounds per square inch for short columns in compression. In a majority of cases the columns used in a building can be considered short, as they are rigidly held at each floor.

Steel is exclusively used in the best examples of Chicago construction. Box columns, of plates and angle bars, and Z-bar columns have been generally used, in which the joints of the columns have been made with a horizontal cap-plate, connected to the column by lugs. The ends of the beams or girders running to the column rested on the cap-plate with ¾ inch to 1½ inch between the end of the beam and the face of the columns. Columns made in this manner are, however, always weak laterally. Recently a column made of eight angle bars in pairs, connected together by tie-plates, has been used. It can be kept the same size from back to back of the angle bars, from the basement to the roof, so that the joint can be made with vertical splice-plates. The column has hollow spaces throughout its length, in which water, steam and gas pipes are placed. Beams and girders are connected directly with the faces of the column, a method which gives great lateral stiffness, as has been satisfactorily shown in the Reliance, Wyandotte, Fisher and other buildings. The columns are generally made in two-story lengths, alternate columns breaking joint at the same floor.

In a building, the height of which is between four and six times its least width, wind pressure becomes an important element, and several methods have been used to provide for it. In the Great Northern Hotel, fourteen stories high, and in the Masonic Temple, twenty stories high, with a roof garden, vertical systems of lateral rods were used, running from top to bottom of the building, similar to those in an iron pier of a railway viaduct. Portal bracing, between certain columns at every floor, was first used in the Monadnock building, and afterward in the Old Colony building and others, but its cost is disproportionate to its effectiveness. Knee braces have been used in the New York Life and in the Fort Dearborn buildings. They stiffen the framework, if carefully designed; but they require great exactness in manufacture, and care in erection.

Plate girders, 24 inches deep, running between all the outside columns and rigidly connected with them, were first used in the Reliance building, 55 feet wide and 200 feet high. The first story of this building was slipped under the upper four stories of the old five-story building in 1891. In 1894 the upper four stories were pulled down, and the new fourteen-story building was erected from the second floor. These plate-girders, the connections of the columns by vertical instead of horizontal plates, and the bolting of the beams and girders directly to the column, instead of resting them on horizontal plates, combine to make each floor rigid in itself, and enable the wind stresses to be carried to the ground on what may be called the "table leg" principle.

The author's practice is to construct the frame to withstand a horizontal wind pressure of 30 pounds per square foot over the whole side of the building. The resulting stresses are supposed to be taken up by all the columns in each row. If the maximum stress in any column from live, dead and wind stresses exceeds 25,000 pounds per square inch, the column is enlarged to bring the stress below this limit. This corresponds with the maximum stress allowed for live, dead and wind stresses, in the best bridge practice — between 19,000 and 25,000 pounds per square inch.

In order that a building may be absolutely fireproof, every part of the steel frame must be covered with a fire and water resisting material, and the outside walls must be made of brick or terra cotta instead of stone. Mr. J. J. Webster, M. Inst., C.E., in his paper on "Fireproof Construction," says: "There is, of course, no such thing as a fireproof structure, if the phrase is taken in a strictly literal sense, no known substance being able to resist a change of state when submitted to intense heat." This is true, but the Chicago high buildings are absolutely fireproof in the sense that they will safely resist any fire which can occur in or around them, as has been shown by severe tests to which certain buildings have been subjected. In one corner of the Rookery building there are janitors' closets, for the storage of supplies and waste paper and containing the gas meters, one above the other, from the first to the eleventh floor. As there are no windows, the floors consist simply of iron gratings, to allow ventilation. A fire recently started in one of these closets, and in a few minutes there was a sheet of flame from bottom to top of the shaft. The gas meters were burned, and the escaping gas aided the fire. Although it was reported by the fire brigade to be an intensely hot fire, it did no damage outside of the closets, except on one floor, where the door was opened for access to the fire. On the other floors no damage was done, even the glass transoms across the corridor being uninjured.

During the building of the Chicago Athletic Club, after the floors and fireproofing were erected, and while the interior was being finished, a fire occurred. About 80,000 feet of oak lumber, oiled and finished, was piled in the building ready for use, and was entirely destroyed, the damage to the building being between $50,000 and $60,000; but the steel frame was uninjured, with the exception of a few beams between the elevators, which buckled owing to the expansion of the iron guides fastened between them. The tile arches in the floors were uninjured. The fireproofing of the columns was destroyed, but this was through their faulty design. Wooden-strips had been wedged between the flanges of the columns every three or four feet, and the fireproofing built between them. These strips were burned out and the fireproofing fell to the floor.

In addition to fireproofing the beams, the floor arches must give lateral stiffness to the floor. In this respect the hard-burned fire clay and the porous terra cotta lumber floor arches are the best

*Abstract from the minutes of proceedings of the Institution of Civil Engineers of England; read before the society December 22, 1896, and awarded a Telford gold medal and a premium.

hitherto devised. Numerous systems of fireproofing have been designed in recent years, nearly all of which are combinations of concrete and iron. Most of them are amply strong as to vertical loading, but none of them, as far as is known to the author, give the requisite lateral stiffness.

The complete description of floor arches given by Mr. Webster in the paper referred to renders it unnecessary to do more than allude to two new arches which have been introduced since that paper was written. The end construction has been universally used in Chicago for the past four years. A 12-inch arch has been introduced, made by the Illinois Terra Cotta Lumber Company. The weight of this arch is 41 pounds per square foot for the 12-inch arch, and 34 pounds per square foot for the 10-inch arch. A new arch has recently been introduced by the Pioneer Fireproof Construction Company; it is deeper than is ordinarily made, and affords much better protection to the bottom of the beam, although it also increases the thickness of the floor.

It has been the custom to place the hollow-tile fireproofing on the back and partly on the sides of the outside columns, and to trust to the brick or terra cotta to protect the remainder. In the Reliance and Fisher buildings the fireproofing is carried entirely round the column, and the brick and terra cotta front is applied outside it. It is believed that the latter method, on account of the air spaces, affords better protection against fire, and is much more effective in preventing moisture from reaching the column.

The following is an extract from the fireproofing specification of the Reliance building: "All columns throughout the building, including the attic, shall be fireproofed with 3-inch tiles, special tiles being used having rounded corners, provided with slots to receive pipes where indicated, set plumb to a line, regularly bonded, having air space between the fireproofing and the iron keyed in place and to each other, and each piece wired to the column with copper wire." Wherever pipes are run alongside of columns, they are separated from the column by the fireproofing.

For preserving the steel frame from rust, the best practice is to thoroughly scrape off the scale and to apply a coat of oil at the mill or shop, and a coat of red lead, graphite or asphalt after erection. This will suffice for the beams, but additional measures are now taken to insure the safety of the columns. In the Ellicott Square building, being erected in Buffalo, New York, all the outside columns are filled with Portland cement concrete, which is generally believed to be an excellent protection to iron. Mr. Eiffel has stated that in cement iron does not rust; and Mr. F. Collingwood has found, from examinations at Niagara, that cement concrete affords an absolute protection to iron against rust. The steel beams used in the foundations are always completely embedded in Portland cement concrete, and are neither oiled nor painted, as the concrete adheres more to the unpainted iron. When the fireproofing is well fixed and covered on the outside with plaster, the column is in a space nearly air-tight, and the danger from corrosion is small. Mr. M. P. Wood, in his paper "Rustless Coatings for Iron and Steel," says: "In fact, for all iron and steel requiring protection from corrosion other than by the magnetic oxide processes, and that depend upon paint for their protection, it is an indispensable condition that the scale must be removed in order to secure the best result. When this is done and strictly pure red lead is mixed with pure raw linseed oil that has escaped the manipulations of the whale or menhaden oil merchant, a paint is produced that will unite so closely to the iron or steel surface as to be only secondary in preservative qualities to magnetic oxide in resisting atmospheric effects." The use of magnetic oxide, such as in the Bower-Barff process, for the steel frame of a large building, is now prohibited by its cost, and, further, it weakens the metal. The ironwork of the tower of the new city hall, Philadelphia, Pennsylvania, was electroplated with copper and aluminum. To quote again from Mr. Wood: "This process is a double one. The first one is designed to protect the iron from rust by an electroplating of copper of 14 ounces per square foot of surface, and a finishing coat of an alloy of aluminum and tin of 2½ ounces per square foot, for color to harmonize with the stonework of the lower stories of the tower; also to prevent oxidation of the copper into a green coating of verdigris."

The process was adopted as a substitute for paint, the periodical renewals of which would have cost $10,000 per annum, the principal amount being due to the use of boiling linseed oil, in which all the material was to be immersed until it had attained the temperature of the bath. The total weight of the wrought and cast iron to be protected is about 500 tons, and comprises 100,000 square feet of surface, the largest single pieces being sixteen columns, 27 feet long and 3 feet in diameter, weighing 10,000 pounds each. These columns received the copper coating inside as well as outside. The outside coating, being most exposed, is double, requiring two operations or baths, while the aluminum coat is given last as the protective coating to all beneath it. The cost of the whole process varies between 1s. 8d. and 4s. per square foot, depending upon the shape of the piece — simple plates, rods, angles, etc., being the least, while curved pieces with large lugs, flanges and core-holes are the most expensive. The principal expense is incurred in the cleaning, and the greatest care is necessary to insure good work.

Mr. Henry M. Howe has advocated the attachment of zinc to iron structures, to oppose corrosion due to differences of electric potential. The following formula has been given by Prof. R. H. Thurston for the probable life of steel suffering corrosion. Life, in years, $= \frac{W}{CL}$, where W is the weight of the metal in pounds per lineal foot of the surface exposed, L the length in feet of its perimeter, and C a constant, 0.0125 for steel in air. The method of determining the value of the constant C is not given. According to this formula, a 12-inch 32-pound I-beam will last 682 years, and a 15-inch 60-pound bar I-beam will last 1,107 years. A column made of eight 6-inch by 3½-inch by ¾-inch L-beams will last 1,640 years, and one of eight 3½-inch by 2½-inch by $\frac{5}{16}$-inch L-beams, such as are used in the upper stories of a building, will last 620 years.

FOUNDATIONS.

Spread foundations are used under nearly all the high buildings in Chicago. Before they are designed, borings are made to an average depth of 30 feet below the bottom of the footings, one at the side of each footing. These show whether there are any sand or mud pockets, and guide the determination of the load to be carried by the clay. The results obtained from a boring at the Reliance building are given as follows, and may be regarded as typical:

RESULTS OF BORING AT THE RELIANCE BUILDING.

Depth. Ft.	Ins.	Nature of Clay.
0	0	
		Arenaceous.
2	6	
		Compact.
7	0	
		Less compact.
9	6	
		Gradually changing into a soft and wet condition.
14	0	
		Somewhat harder.
15	6	
		Soft and wet.
31	0	

Depth. Ft.	Ins.	Nature of Clay.
31	0	
		Softer.
32	0	
		Very soft and wet.
42	0	
		Harder.
44	0	
		Very soft and wet.
51	0	
		Somewhat harder.
56	0	
		Soft and wet.
64	0	

In the following table are given the results of two tests made to determine the bearing power of the soil, made in 1890 on the site of the Masonic Temple. A tank supported on a plate having an area of two square feet was gradually filled with water. In the first test the plate rested directly on the hard pan, and in the second test it was placed in the bottom of a hole 2 feet 4 inches deep in the hard pan. The foundations have in some cases been sunk into the hard pan, so as to give greater basement height. These tests show, however, that it is the safer practice never to descend below the top of the hard pan. If the borings show any sand-pockets or soft spots, the contractor is required by the specification to excavate them and fill the cavity with concrete.

TESTS OF SUPPORTING POWER OF THE SOIL ON THE MASONI' BUILDING SITE.

	Time of Loading.	Load.	Total Settlement.
		Lbs per Square Foot.	Inches.
Test 1	10th October, 10 A.M.	267.0	....
	" " 2 P.M.	2,226.5	¼
	11th " 10 A.M.	4.675.5	$\frac{11}{16}$
	13th " 4 P.M.	5,655 0	$1\frac{9}{16}$
	14th " 5 P.M.	5,655.0	$1\frac{13}{16}$
Test 2	18th " 4 P.M.	334.0	....
	20th " 9 A.M.	1,327.0	⅝
	" " 2 P.M.	2,280.0	⅞
	" " 3:30 P.M.	2,965.5	$1\frac{1}{16}$
	" " 4:30 P.M.	3,767.0	1⅜
	21st " 9 A.M.	4.311.5	$1\frac{15}{16}$
	" " 1 P.M.	4 934.0	2⅛
	" " 5 P.M.	5 627.5	$2\frac{13}{16}$
	24th " 7:45 P.M.	5,627.5	4⅛

The load per square foot having been deduced, the areas of the footings are determined. The areas of adjacent footings are often found to overlap; they are then combined as one footing, three or four being sometimes treated in this manner. In all such cases the middle of the footing is made the center of gravity of all the loads upon it. The areas of the bottom-plates of the cast-iron shoes, or bases, upon which the columns rest, are thus derived, and the thickness of the bottom-plate and the other parts of the shoe is calculated. Under the shoes are placed layers of steel I-beams at right angles to one another, until they cover an area 1 foot or 2 feet smaller in each direction than the required area of the footing. Under the bottom course is spread a layer of concrete between 12 and 16 inches thick, and covering the area required for the footing, and each layer of beams is entirely embedded in concrete. The completed footing forms a solid pyramid of steel and concrete, possessing much greater strength than if it were composed simply of beams piled in the same manner. This increased strength is taken into account in calculating the sizes and number of the beams in the different layers. The projections of the beams in any layer are regarded as cantilevers, and the portions of the beams covered by the layer above are considered to be subject to shearing stresses only. The total load of both columns in one of the large footings of the Masonic Temple, for example, including the weight of the masonry in both piers, is 2,750,000 pounds; the length of the beams in the layer considered is 25 feet 9 inches; and the projection from the end of the beams to the center of the outside beam in the layer above is 10 feet 6 inches. The bending moment is therefore $\frac{2,750,000}{25.75} \times \frac{10.5^2}{2} = 5,887,000$ foot pounds. The layer is composed of forty-two 15-inch 60-pound I-beams, and their total bending moment, using a fiber stress of 20,000 pounds per square inch,

is 6,014,400 foot pounds. The author uses a stress of 20,000 pounds per square inch for foundation beams which are absolutely free from shock or vibration of any kind. It must be remembered that the load on a foundation increases very gradually. The foundations are in place several weeks before any load is applied, and it is eight or nine months before they receive their full load, so that the concrete has time to become perfectly set. The best Portland cement is used, and the greatest precautions are taken in making the concrete. In the Masonic Temple the foundation concrete was made of one part of Portland cement, two parts of clean sharp torpedo sand, and three parts of clean broken stone which would pass a 2½-inch ring. Between the beams crushed granite, not exceeding ½-inch cube, was used instead of the broken stone. As the beams must be far enough apart to allow the concrete to be filled and well rammed between them, and as the top layer is covered by the bottom plate of the cast-iron shoe, this layer can have but few beams, and they are therefore short. Each succeeding layer, being able to carry more beams, may be longer.

The dead load only is used in designing the footings, in order to secure a more uniform settlement of the building. The amount of the settlement is of small importance, provided it is equal in all parts. If the live load were considered in the calculations, the interior footings would carry a much higher percentage of live load, and it would be impossible for the buildings to settle uniformly. In the case of the Marshall Field warehouse in Adams street, designed by the late H. H. Richardson, the live load of 75 pounds per square foot, on every floor, was carried down to the footings, according to the practice in New York and Boston. The result is that all the floors have risen considerably at the center.

Pile foundations have been very little used under office buildings, although almost invariably under the warehouses and other buildings on the banks of the river. The Art Institute, Public Library, Schiller Theater and Stock Exchange rest on piles, 40 feet to 50 feet long, driven in accordance with standard formulas for pile driving, and treated as bearing piles. At the Stock Exchange, in addition to the piles, wrought-iron tubes filled with concrete were sunk to a considerable depth. The latter form, however, a very expensive foundation. Pile foundations have been used for many years, and the spread foundations are perfectly safe, as the number of large buildings standing on them prove, some of which have been erected ten or twelve years.

In the Fisher building piles were employed, but the principle involved in their use is entirely different from that referred to, for they are essentially spread foundations. On account of the absence of a party-wall contract, it was found impossible to use the ordinary spread footings along the party line. The author considered that by driving short piles the clay would be compressed, and would be in the same condition before the building was commenced as it ordinarily assumes after a heavy building has been erected upon it. The clay would, therefore, stand a greater load than would otherwise be considered safe. Accordingly piles 25 feet long were driven at 3 feet between centers. The load for each pile was 25 tons, the 9 square feet of clay around each pile being loaded to nearly 6,000 pounds per square foot, the pile being disregarded. The piles, however, will act with the clay in bearing the load, for it required between four and eight blows with a 2,500-pound hammer falling 20 feet or 24 feet to drive the piles down the last foot.

A foundation designed by the author for an office building is now being erected in Washington street. The building, which will be eleven stories high, is 40 feet wide by 165 feet long, and is between two buildings, one four, the other seven stories high. The walls on both sides had formerly been party walls, but new contracts had not been obtained, so the footings had to be kept entirely within the site, the boundaries being the middle of the existing walls. To shore up these walls and carry the foundations to the boundaries, would have been a costly and somewhat hazardous operation, as the footings would occur close together along the walls, and would penetrate considerably deeper than one wall. The plan adopted allowed piles to be driven along the center of the lot, parallel to the walls, with a minimum distance from both walls of 6 feet. On the top of each row of piles a plate girder was placed, upon which the four columns occurring in the width of the building rest. Piles were used in the same manner as in the Fisher building, the tops of the piles being embedded in concrete instead of using a timber grillage.

In the Great Northern theater, hotel and office building, in course of erection on the east side of the Great Northern Hotel, in Jackson street, the theater is in the middle of the building. Heavy walls separate it from the office and hotel portions. These walls, each weighing, with the floor loads, 60,000 pounds per lineal foot, meet the east wall of the present Great Northern Hotel at right angles. This east wall had been originally regarded as a party wall, and its footing had been constructed strong enough to carry a floor load from each side. The end of the theater wall where it meets the east wall could not rest on the footing of the latter, which projects 9 feet 6 inches, as it would overload the footing, besides being only on one side. The old building had practically stopped settling, and the new one would probably settle 7 or 8 inches. The floor load, however, from the east side had never been put upon this footing, and in addition it was deemed safe to load it somewhat higher than formerly, as the east wall, fourteen stories high, had been resting upon it for four years. Plate girders were placed lengthwise in the theater wall, with their ends projecting through the old wall, and resting on 36-ton hydraulic jack screws, which in turn were supported by I-beams lying on the footing and parallel to the old wall. The plate girders were of such a length, and so situated, as to transfer to the old footing the desired weight. The screws were raised to their full height, so that they could be lowered 14 inches if necessary. As the new building settles these screws will be run down at regular intervals, until the settlement stops, which will probably be in four or five years. Levels will be taken during that period. After the settlement has ceased, the screws will be surrounded with concrete and left.

The spread foundations of Chicago have often been referred to as floating, and the soil has been regarded as a fluid, the settlement being constant, with more or less lateral displacement. The author does not believe that any such lateral movement exists, for it would follow the line of least resistance; and with a heavy building on each side of the street, for example, the Great Northern and Monadnock, it would show itself in the disturbance of the network of pipes in the street, and in the forcing up of the pavement itself. The settlement is due to the compression of the clay, the water being pressed out of it. In the Masonic Temple four of the main columns, near the lifts, carry heavy loads and have large footings, and between them are two small columns which only carry the stairs. As these had much smaller footings than any others in the building, they were given a higher load per square foot. During the construction of the building, the four columns had received the greater portion of their loads when the erection of the stairs was begun. It was found at once, that the connections on the stairs would not fit those on the columns, the latter being too high. Levels taken to ascertain whether the small columns had been forced up, showed that they simply had not settled with the rest of the building. About 75 tons of pig iron were then loaded on both footings, and allowed to remain for a week. Although the load then amounted to 7,000 pounds per square foot, twice the load on any of the other footings, the column only settled about one inch less than one-half the desired amount, and so the connections had to be changed all the way up the stairs.

The compression of the soil varies with the load, is greatest when the load is first applied, diminishes and finally stops. The ground plan of the Masonic building gives the positions of the six columns. The levels of the two interior columns could not be taken after October 20, 1895, as the old marks had been covered. These curves are rapidly approaching a horizontal line; the amount of settlement since the last levels were taken, almost two years ago, is nearly the same in each case, the maximum variation being only ⅛ inch, although they had varied considerably before. The auditorium settled more than 20 inches under the tower, but this was due to the fact that several stories were added which were not in the original design and were introduced after the foundations had been inserted. Probably none of the high buildings on spread footings settled less than 6 inches. The amount of settlement generally is between 6 and 12 inches. This settlement is anticipated when construction is begun, by raising the level of the bottom of the footings by the amount it is thought the buildings will settle. This causes the footways to be steep at first, but they approach their proper slope as the buildings settle. The foundations of the Great Northern theater have been raised 9 inches.

WEIGHT AND COST OF THE STEEL FRAME.

The weight of the steel frame in an office building sixteen to twenty stories in height, ranges from 1⅝ pounds to 2 pounds per cubic foot of the building. The cost is between 4.9 cents and 6 cents per cubic foot, being one-seventh to one-ninth of the cost of the building.

It requires between seven months and a year to erect and completely finish an office building. At the Reliance building work was begun by pulling down the upper four stories of the old building, on May 1, 1894. Some delay was caused by the construction of a temporary roof over the second floor and making connection to the first story columns. The first floor was occupied during the whole time of construction. The building was finished and tenanted on April 1, 1895. At the New York Life building, twelve stories high, excavation was begun on July 14, 1893, and the foundation was begun on August 3. The steel frame was completed on September 29, and on December 2 steam heat was turned on to the entire building. At the Champlain building, fifteen stories high, excavation was begun on September 12, 1893, and the foundation ironwork on October 10. Between October 15 and 25 work was stopped pending decision as to the party wall. On December 23 the ironwork was completed, and on January 4, 1894, the fireproofing of the floors was finished. Both these buildings were ready for tenants in the early spring of 1894.

The author desires to acknowledge his indebtedness to Mr. D. H. Burnham for much valuable information and kindly criticism, and to Mr. W. L. B. Jenney and Mr. William Holabird for data and drawings relating to the history of skeleton construction.

The paper is accompanied by seventeen tracings and fifteen photographs.

THEODORE W. PIETSCH, of Chicago, at one time a draftsman in the office of Burnham & Root, and in whom Mr. Root took an interest, has graduated in architecture from the Ecole des Beaux Arts. He first took the course in the "Teck," at Boston. In his entrance examination at the French school in 1892, he ranked first of two hundred and fifty pupils — the first American to achieve that honor — and at the close of his five years was awarded a medal and diploma. He will return to practice in Chicago.

OIL PAINTS AND THE PAINTER.*

BY ALBERT W. HAYWARD, F. A. I. A.

I SELECTED this subject as being, perhaps, the chief of those practical ones we can so profitably discuss, but the subject is so vast I have been able to cover only a small portion of it in a single paper, and, therefore, hope other members of the Chapter will contribute something in the same line, before taking up another branch of the work entering into our buildings.

For the purpose of this paper I have read literally stacks of trade and other literature bearing on the subject; I have corresponded with a number of the prominent paint manufacturers and have personally conferred with the representatives of several of such concerns; besides I spent half a day inspecting one of our leading white lead works, and finally discussed the subject of paints generally with several of our leading painters. What I have learned in this way has added materially to my stock of information on the subject of both paints and painting, though some of this information is so contradictory that it puzzles me as to what or whom to believe, the weight of authority often seeming equally divided, and this is especially the case in the matter of best coating for metalwork.

Master house painters, as the bosses term themselves, are, as a rule, opposed to the use of ready-prepared paints, though it would seem as if the large manufacturers, with every facility at command, could prepare a better paint than can the average painter, and it must be prepared by one or the other before it can be used.

I have not been able to see how the architect can place any more reliance in the mixture of the average painter than the average manufacturer, for we must certainly give one class credit for as much honesty as the other. I do not believe the average painter himself has any more faith in the paint mixed by one of his competitors than he has in that mixed by the manufacturer, so why does he expect the architect to put more confidence in the painter than the manufacturer? The manufacture of paints is quite a history. It has passed through many stages of evolution and is steadily advancing, and I believe the most rapid strides of recent years are due to the earnest and scientific efforts of the manufacturers of the ready-mixed variety.

As methods have changed or modernized in other lines, so have they, or, at least, so will they, in the paint trade.

The time was, not so many years ago, when it was absolutely necessary for a painter to mix his own paints, and while some old-timers may still advocate this as the only reliable method, it is at least no longer so necessary, and I really believe that before many years it will be generally considered an out-of-date custom and will become a lost art, so far as the painter is concerned.

There are snide ready-mixed paints just as there are worthless goods in other lines, but with this difference, perhaps, that, while other standard articles are, as a rule, good, ready-mixed paints are, as a rule, poor. I say this not only because the painters claim that ready-mixed paints are, as a class, poor, but because even the manufacturers admit that few of this class of goods are meritorious; so we have to be even more careful in the selection of a ready-prepared paint than with the unmixed materials. It is my opinion, however, that the very best paints obtainable today are to be found in the ready-prepared class, though in this same class may be found the very poorest, and that if the painters would only try as hard and honestly to produce a good job with a standard prepared paint as with his own mixture, he would soon find it was to his own advantage, as well as to that of his customer. Any paint can easily be spoiled between the factory and the brush, and, too, there is not a little in the conditions under which it is applied, so that even the failure of a ready-mixed paint does not always mean that the manufacturer is at fault.

I believe you will all agree with me that there is no branch of the work coming under our supervision with which we can be, and undoubtedly are, so often deceived, as with the painting. No other branch is so full of opportunities for deception and so difficult to supervise to any certainty.

The temptation to adulterate paint materials is especially great, because it can be done both so profitably and so safely; adulterations being practiced that must yield several hundred per cent profit and some that even the analytical chemist can hardly detect.

The ignorance or indifference on the part of the consumer, the builder and even the architect has so nourished the adulterators in some lines and the uses of their materials that they have been enabled to nearly crush out the honest producers and the users of honest goods.

It requires unceasing effort on the part of the really honest to fight the dishonest branch of the painting business. This is a shameful condition and we architects should certainly do all we can for the honest side of the struggle; it is our duty and a natural one, as it is also to our interest, for whatever tends to improve the character of the work or materials entering into our buildings helps us as much as can anything else.

I realize fully the inability of an architect to treat a subject, such as paints, as authoritatively or as interestingly as might the paint manufacturer, the paint chemist or the practical painter, but as architects we certainly have the opportunity for a wider general experience with the subject and a better opportunity to judge of general results than does any other class, and it is for that reason I have not hesitated to tackle both paints and the painters.

The quality of materials and workmanship I believe depends more on the architect than on anyone else having to do with a building, even more than on an owner who may wish to keep the cost below a practical limit, for an architect who values his reputation will not allow himself to be thus made use of to his professional and business detriment.

If we could always specify what we believe to be good materials and have to do only with competent and honest contractors, our work would likely always be a credit to us, and we would not, in a year or so, have occasion of being ashamed to admit our connection with it.

If at times we are disappointed in a contractor or in any material we have specified, I would suggest that we lay the matter before the Chapter for a full and fair discussion, as this might save the rest of us a similar unwished-for experience, and, too, might show just where the fault lies. Even an architect can make a mistake, as we all well know, and he should be just as anxious to avoid his own as those of the contractor or material man. We can certainly learn something from the contractor, something from the material man and something from one another, and the Chapter is the best means to this end.

Oil paints, for architectural purposes, usually have two objects—protection and decoration — they consist of a vehicle for mixing and binding, and a pigment for giving body and color. Durability in both the vehicle and the pigment is essential, as they are so interdependent, that the failure of one about equally affects the other.

The vehicle carries the pigment and makes its application as a paint possible, and besides this duty, it must serve both as a binder between the particles of the pigment and between the paint and the surface to which it is applied.

The pigment, besides usually serving a decorative purpose, must also do a large share of the practical work, and, in order to accomplish this, it should unite chemically, or, at least, mechanically, with the vehicle, for in this way only can it help to preserve both its vehicle and the surface or material over which it is applied.

A paint, therefore, not only has to protect the material or surface upon which it is applied, but also its own ingredients, and as there are many varieties of trying conditions to which paints are necessarily subjected, their preparation requires much scientific study and great mechanical care.

All will acknowledge that the ideal paint has not been discovered; the best has many weaknesses, but if properly used, it answers the purpose fairly well, so that our chief trouble lies, not in the defects inherent to even the best of paints, but in the difficulty of determining just what is the best and in securing it when specified.

Tests for the purity of paint ingredients have, no doubt, to a considerable extent, checked the manufacture and use of worthless substitutes and adulterants, but, in practice, the chief value of such a test to the architect lies in the fact that it is also a test of the honesty of the painter, and after all, this question of the honesty of the painter is often our only guarantee.

Linseed oil as the vehicle and white lead as the main or body pigment have today, as of old, a majority of advocates for general purposes, so we will consider them the standards.

As a substitute or adulterant for linseed oil, a great variety of oils are used, such as cotton seed, fish, rosin, petroleum, and, in fact, almost any kind of an oil that can be sold cheaper than pure linseed.

There are also paints the exact vehicle of which is a secret and only the manufacturer, and possibly the Lord, know what it is, but you can generally rest assured that pure linseed oil is conspicuous in it only for its absence.

What vehicles were used in ancient times I have been unable to learn, except that the Greeks and Romans sometimes used wax, though in most instances, I believe, the natural mineral or vegetable colors were applied merely as a stain; paint, as an opaque protective coating, being unknown. It would be interesting to know the ingredients used by the ancients in their architectural painting, but as much of this is ranked among the lost arts I could find little on the subject that is not merely speculative and consequently of small practical value.

Linseed oil, though the best known vehicle, has many weaknesses, the chief of which is, that when dry it is porous, some authorities saying "as porous as a sponge and that it absorbs moisture as readily." This is probably exaggerating somewhat, but there is no question that even under not a very powerful microscope it looks something like tripe, and of course its pores, however minute, must admit moisture and injurious gases, and consequently as a coating for metal it is at least questionable, though many advocate it especially as a priming coat before structural steel work leaves the mill.

Linseed oil, being a vegetable extraction, is, by its nature, readily perishable, certain elements, or even a temperature above 160 degrees, decomposing it, but with all its recognized weaknesses, it still remains the champion vehicle.

Linseed oil, as you probably all know, is extracted from flax seed, and this is done by crushing and grinding. The seed is sometimes steamed to increase the yield, but the cold-drawn oil is the better article.

While the quality of linseed oil depends somewhat on the manner of its extraction, all pure linseed oil is practically uniform in its main qualities as a paint vehicle, and the important thing is to have it as free as possible from sediment. By allowing it to stand for some time in a cool place, linseed oil will clarify or season naturally, which gives a better article than where this process has been hastened artificially. There is a so-called refined linseed oil,

*Read before Cincinnati Chapter, A. I. A., December 27, 1897. Revised by the author for THE INLAND ARCHITECT.

which is the best quality produced; but as I understand it, it is merely freer from sediment or dross and consequently clearer.

Linseed oil kept from the air will never dry; however, it does not dry by evaporation, but combines with the oxygen of the air and dries or rather hardens by oxidization. When mixed with certain pigments, such as red lead or litharge, this process of hardening or drying is known as saponification, that is, the oil unites with the pigment base, absorbs oxygen, and forms a hard, insoluble oxide soap. As linseed oil naturally dries or oxidizes very slowly, it is usually necessary to hasten this process, and this is done by boiling the oil and at the same time adding driers or oxygen absorbents; or, in some cases, simply by adding driers to the raw oil. Where driers are merely added to the raw oil and it is palmed off as boiled oil, it is, in painters' parlance, called "bung-hole" boiled oil. Plain raw oil, naturally, is more likely to be pure than the boiled variety, as it has had less opportunity to be "doctored" or tampered with.

Linseed oil naturally contains about eight per cent of water, and also certain impurities called "mucosities," and by boiling the oil, these undesirable ingredients are, to a certain extent, gotten rid of, though the exact changes that take place in the oil, during its boiling, are said not to be satisfactorily explained, even by analytical chemists.

The use of dryers somewhat adversely affects linseed oil by decomposing it — at least it is so claimed by many authorities — but time and other practical considerations are usually so great that the use of a dryer is imperative, and we must, therefore, blame the natural weakness of the oil and not the dryer for any resulting damage.

When a paint is too thick for easy working, painters are accustomed to use a "thinner," such as turpentine, benzine, naphtha, or other volatile oils; but, as these ingredients soon evaporate, it means stretching out the paint, giving less linseed oil and pigment to the superficial foot and saving labor, to some extent at least, at the expense of the wearing qualities of the paint, though many painters claim that it is absolutely necessary to, in this way, "take the grease off the oil" of the under coats in order to make a good job. Sometimes it is desirable to get rid of the natural gloss of the paint, and this is usually done by cutting or dissolving the oil by means of turpentine, securing a flat or "matt" effect, but where a protective covering is the most essential consideration, it would seem as though flattening should never be done.

For any one wishing to know whether or not a certain oil is pure linseed, there is this simple standard test, which perhaps most of you have read. Take a long two-ounce bottle or a test tube, pour in equal parts of the oil and ordinary nitric acid — say one-half ounce of each — shake the mixture well and let it stand for about twenty minutes. If the oil is pure, the upper stratum will be a straw color and the lower almost colorless. Even five per cent adulteration will change the upper stratum to dark brown or black, and the lower one to bright orange or dark yellow, according to the material used as adulterant. As far as I can learn, all the usual substitutes for linseed oil are rank frauds. They are merely temptations to the weak-kneed, and godsends, or, rather, devilsends to the naturally dishonest painter or paint manufacturer.

An idea of the extent of the fraud perpetrated may be judged by this: that, while pure linseed oil, or what we have every reason to believe is pure, is selling at, say, 35 cents per gallon wholesale, worthless substitutes or counterfeits are privately offered and sold to some painters as low as 19 cents per gallon, and this price probably gives a much larger profit to its producer than is realized by the manufacturer of the pure oil, to say nothing of the profit realized by the painter off his victim.

Not only this, but I have been told that formulas have been confidently offered certain supposed-to-be-approachable painters, whereby they might do their own adulterating or stretching out of linseed oil, or in some cases even produce a cheap substitute concoction containing absolutely no linseed oil, and, what is the worst of it, some of these adulterated oils when mixed with pigments are, on casual observation, calculated to deceive almost anyone but an expert, and also, unfortunately, they often stand and look all right just long enough for the painter to get his money.

There is a law in the State of Ohio against labelling or selling as pure an adulterated linseed oil, and I am told that this law was engineered through the legislature by some of the manufacturers of ready-mixed paints, because they found it very difficult to get pure oil, and wished to have the privilege and profit of doing the adulterating themselves, if there was to be anything of that kind going on. There are certain oil preparations known as emulsions and it was the introduction of this process, a few years ago, that first made the mixed-paint business in this country profitable, and it is from this that it has grown to its present magnitude and perfection. This emulsionizing process was at first claimed as proprietary by one of the largest Eastern paint concerns, and as other paint manufacturers disputed their claim and persisted in using it, a bitterly contested lawsuit followed, which developed the fact that, after all, this was a French discovery, and not patentable in this country. As soon as this became known there followed a perfect epidemic of emulsion paints, or, as some were called from their beautiful glossy appearance, enameled paints.

Time, however, soon began to play havoc with all of these at first very popular paints; they could not expand with the material over which they were painted; and, too, as they dried harder and harder, they shrunk more and more, and the natural result was that their originally beautiful enameled surface checked terribly, the edges of the cracks shrunk in, and there resulted what was dubbed an "alligatored effect," one hardly creditable to any paint. Their apparently chief merit, hardness, in fact proved to be their greatest fault. There was absolutely no "give" to them, and a paint must have elasticity or it is bound to crack.

These paints became in time like adamant and adhered like a poor relation, and when it came to removing them before repainting, which was absolutely necessary owing to the roughness of the surface, again did their very strength prove their weakness, and it was only by the tedious and expensive process of burning that this could be done at all. There are still enameled paints on the market, but they are made according to materially revised formulas, the outcome of sad experience and much careful experimenting.

If the innocent little girl who prayed, "Dear Lord, make me pure, make me absolutely pure, like baking powder," had instead said white lead, it would have been to the same point, for these two preparations in particular are always and only advertised as absolutely pure, nothing milder seems to do; but as nearly every manufacturer, or combination of manufacturers, also claims that theirs are the only pure goods in that line, the public has naturally come to be somewhat skeptical, and is likely to merely smile at such a saintly claim, though I believe all the corroders, at least, do turn out a white lead that is absolutely free from adulterants, though there is certainly considerable difference in the quality of their product.

The adulteration of linseed oil pales before the magnitude and audacity of adulterations in white lead. It has become so notorious that those who really do produce and offer for sale a pure and genuine article have, for very self-protection, had to combine in an effort to stamp out the frauds by showing them up to the public; but notwithstanding it has been definitely shown and proven to architects, engineers and the public generally, that many brands of advertised absolutely pure white lead contain 80 to 90 per cent of cheap adulterants, and even in some cases not a trace of white lead, this illegitimate business still seems to flourish. The continued exposure and the gradual education of the public in the matter, however, must in time considerably lessen the evil, even if it cannot stamp it out.

We have within our reach the blowpipe test for white lead, and probably you have all either tried it or have seen it tried, and incidentally have noticed the beautiful opalescent colors emitted by the molten lead globule. All that is needed to make this test, besides a little of the material to be tested, is a blowpipe, a suitable piece of charcoal, and a suitable flame. With a mixed paint, however, there are certain facts to be taken into consideration and understood before the failure of this test proves a clear case of adulteration; as, for instance, a trace of zinc white will prevent the white lead from returning to its blue metallic state; while in truth zinc white, if used in judicious quantity, is no more an adulterant of white lead or of paint than is the seasoning in a good soup.

Centuries of experience have demonstrated that white lead is the best known body pigment for general painting. There are certain materials recommended for particular purposes that may have superiority over white lead, but for general painting white lead stands at the head of the list, if not alone. Its greatest weakness is its tendency to chalk, especially if the lead has been but recently manufactured; but the addition of a little zinc white is said to correct this fault. White lead, as you all know, is the carbonate of lead, and is made from the lead ore, one of the two chief pigment bases, iron being the other. The metallic lead is first cast into "buckles" resembling gridirons; these are about 5 inches in diameter and ½ inch thick. The "buckles" are placed in what are called corroding pots. These pots are about 12 inches high, and made some 2 inches smaller in diameter for the first few inches up from the bottom, forming a ledge inside, and upon this the "buckles" rest, leaving a pocket below for holding the corroding acid. These corroding pots are placed side by side in the corroding house — which is nothing more than a common wooden shed — on a bed of partially spent tanbark, being the refuse from a tannery.

After a layer of pots has been placed in position, about a pint of diluted acetic acid is poured into each, and then a dozen or so "buckles" are put in, lying flatwise on one another, after which the pots are covered with boards forming a platform for another bed of tan bark and another layer of pots, and so on until from eight to ten layers of pots, sandwiched with tan bark, have been built up. The whole stack is then closely covered and allowed to stand until the corrosion is deemed to be at the proper stage, which requires about one hundred days, when it is opened, taken down layer by layer, and the "buckles," now turned wholly or in part to a friable white substance, and considerably warped out of shape, probably explaining their name, are emptied from the pots and taken to the mill.

Confining the tan bark in the stack causes a slight fermentation, generating carbonic acid gas and heat; the heat evaporates the acetic acid in the bottom of the pots; this, together with the carbonic acid gas, attacks the lead passing through the openings in the "buckles" and also between them, as they lie loosely on one another, and so reaches the entire surface of the metal; the acids gradually oxidize the lead, forming first a carbonate of lead and then hydrated carbonate, which is the pure white lead of commerce, needing only to be separated from all uncorroded particles, washed of the acid and finely ground. These latter processes, however, are most important, and probably the most

important of all is the grinding, for I am told that at least one ready prepared paint manufacturer considers it necessary to regrind the lead even after it has passed through the corroder's mills.

From each layer of the corroding pots a wooden chimney or flue leads up through the top of the stack for carrying off the heat and vapor caused by the fermentation, and by means of a cover or damper at the top of each flue the temperature of each layer, is, to a certain extent, controlled, which is an important matter in order to secure the best and most uniform results throughout the layer. About 75 degrees is the temperature it is desired to maintain during corroding process. It is the slowness of this process and the difficulty and uncertainty of controlling the temperature of a lot of fermenting tan bark that has prompted so many attempts of recent years to supplant this so-called old Dutch process, though in fact the genuine old Dutch process did not employ acetic acid as a corroder and hastener, it being then too expensive, but relied entirely on the much slower and, I am told, less satisfactory process of carbonic acid gas, generated by fermenting manure.

As before said, from the corroding house the carbonated lead goes to the mill, and there first, by graduated crushers and sifting devices, the imperfectly corroded portions of the metal are to a large extent, and so far as possible at this stage, separated from the pure white lead, for it is important to exclude the particles of natural lead, as you can readily understand these tend to fill the grinding stones and make them inoperative; the white lead then goes through a rather complicated succession of graduated grinding machines, alternating with settling and floating devices, until it is finally bolted through cloth the same as flour, except that it is in a liquid form.

In order that the grinding and transporting machinery may be enabled to do their work, and at the same time, the white lead be cleared of every particle of uncorroded metal and the corroding acids, it is mixed, soon after it enters the mill, with water, with which it unites readily, forming a paste, and at some stages even a running liquid, and after finally being bolted, the white lead is separated from the water or vice versa by two very different methods. By one the water is simply dispelled by drying the white lead paste in large open steam-heated pans, also using blowers to hasten the evaporation; but in the other the lead-water paste is mixed directly with linseed oil and the natural affinity of the white lead for the oil is so great that the water is entirely dispelled from the agitated mass and is drawn off at the top of the mixing vat, thus reversing the natural relative positions of mixed oil and water; and, too, strange as it may seem, by this latter process there is by actual chemical test less water remaining in the white lead than where it has been dried by combined heat and aërification.

The usual adulterant of, or, in some cases, absolute substitute for, white lead is barites, or heavy spar — being the heaviest of earths and nearly as heavy as white lead. It is a mined crystalline rock of various colors, the whitest, of course, being selected for the purpose of a white pigment. It is susceptible of being ground about as fine as white lead, but when mixed with oil, it is no longer opaque and consequently has no body. It has neither chemical nor mechanical affinity for the oil and absolutely refuses to absorb or unite with it, any more than would so much ground glass; consequently is altogether worthless as a permanent pigment. When barites is substituted for white lead, which, unfortunately, is the rule rather than exception in mixed preparations, the extent of the fraud, to say nothing as to the worthlessness of the substitute, can be judged by the relative costs per pound to the consumer of ¾ cent and 5 cents.

If barites has any real recognized legitimate use in oil paints, I have not been able to learn of it, and still it is today one of the most extensively used pigmentary materials on the market, though never openly. Chemical analysis first pulled off the mask and exposed its secret use not only in white lead but in many color pigments.

Whiting, terra alba, kaoline, silica and other white substances are also used for adulterating or supplanting white lead, but being so much lighter in weight, they are not nearly so popular as barites, their bulk often betraying their presence, if used in at all large proportions.

Next to white lead in general importance, stands red lead — the oxide of lead — made either from the ore direct or from white lead, the latter giving what is called orange mineral, which is the finest quality of red lead.

In the manufacture of red lead, the lead ore or white lead is melted in a suitable retort, while over it is passed a strong current of air from which the oxygen is absorbed. As the temperature of the metal rises, it first turns yellow, which gives litharge, and then red, which gives the red lead, that only needs to be ground exceedingly fine to fit it for use as a paint pigment.

Red lead also can be reduced to the metallic lead by heat, but it requires a much higher temperature than does white lead and consequently considerable skill to accomplish this with the blowpipe.

Red lead, when mixed with linseed oil, dries much quicker than does white lead, and, in fact, dries so rapidly that only a small quantity can be mixed at a time; consequently, it is not popular with either ready-mixed paint manufacturers, painters or roofers; also, as it cannot be adulterated to such an unlimited extent or quite so readily as white lead, another reason for its unpopularity is apparent; but this latter fact, at least, should certainly not militate against it in the estimation of the architect.

Its bright color is objected to by some; but this can be modified considerably without, to any appreciable extent, lessening the quality of the material, by the addition of a small quantity of pure lampblack, or over the red lead coats a white lead finishing coat can be applied, giving any color effect desired.

After reading many seemingly highly authoritative opinions, I believe the preponderance of testimony is in favor of red lead as a protective covering for iron and tin, though it should never be used on galvanized iron — yellow ocher, I believe, being considered better than any other pigment for this purpose.

This leads me to oxide of iron, or mineral paints as they are often called, which, by many, are still considered the best coating for metalwork, or at least as a perfectly safe material; but I believe mineral paints are losing their popularity and that their use is diminishing, so far as the painting of important structural metal work is concerned. Not a few will vigorously deny this assertion, but as many, if not more, will just as vigorously affirm it.

The names mineral paint, oxide of iron paint and venetian red paint mean nothing, so far as exact quality is concerned — the object in such paints being to have them possess as much oxide of iron as possible — but under these names the proportion can vary from four per cent to ninety per cent. Therefore, it is necessary to specify the percentage of oxide of iron required, in order to anywhere near gain the point desired.

It is claimed by the manufacturers of some of the oxide of iron paints that their product is perfectly inert and that consequently no action of the elements can possibly affect it, but others claim that every oxide of iron paint contains more or less sulphurous elements, which, on exposure to moisture, generate sulphuric acid, and as this vigorously attacks any iron surface exposed to its action, that consequently oxide of iron paint is the very worst that can be used for painting metalwork.

Possibly, owing to the curious belief that "like cures like," oxide of iron paints may have gained their popularity, though the manufacturers of some of these paints spurn the idea; but, at least, as now usually made, many good authorities consider them rust producers rather than rust preventives.

Some authorities insist that the pigment for metal painting must be inert, while others say this is not at all important, and so it is with a great many other points, especially with regard to metal painting, but I was impressed with the great stress laid by one and all on the importance of first having any and all surfaces to be painted in proper condition, and also the importance of having a dry atmosphere and a normal temperature in order to secure the best results. With these points neglected, even the best of paints will give but poor results — a clean, dry surface with even a poor paint being preferable to a damp, dirty or rusty surface and a good paint.

Paint will not adhere well to a damp surface, and as dirt begets decomposition and rust breeds rust, it is apparent enough the importance of considering these matters. I was told, however, by one of our leading general contractors this rather contradictory story, that just before painting same he had thoroughly wet a common brick wall by turning the hose on it, and he declared the result had been more satisfactory than with any dry wall, as years of wear had proven; but I am rather skeptical and would not advocate this method on a single testimony, however apparently trustworthy.

There is, what no other word so well expresses, a "crazy" idea prevalent among painters that a tin roof should be allowed to at least begin rusting before it is painted; they may not realize the harm done, but it would seem as though the least judgment would show the fallacy of this idea, and that no good painters would think of doing such a thing; but I have known otherwise perfectly sensible painters to advocate this harmful method.

It is a well-known fact that rust spreads naturally, almost as microbes multiply; once started, it attacks the surrounding metal, and this goes on to some extent even when covered with the best of paint. If it is difficult to make the paint adhere to the smooth and slightly oily surface of the tin, it should first be thoroughly wiped with waste, and in every case this is best, but as soon as possible after the tin is soldered, it should be thoroughly painted. Where not interfering with the soldering, it is best, of course, to paint the tin before it is exposed to the weather, and so run no risk of its rusting.

Tin has a bad name, so far as its durability is concerned; but I believe if it is first properly cleaned and kept well painted, that it is rendered practically indestructible from rust. It is, however, impossible to have tinwork delivered to our clients in an ideal condition, besides, the owner is more than likely to neglect it afterward, and the tin, consequently, will soon rust through and get all the blame for it. Copper is, therefore, a preferable material, and even at its unfairly, because unnecessarily, high price, is cheaper in the long run.

Zinc white has its own special uses, which you probably all recognize; it certainly has no equal in the purity of its white, and has the additional advantage over white lead that it is not discolored by sulphurous or hydrogen gases and does not flake or chalk. Zinc white unites with linseed oil with a stronger chemical affinity than does white lead, and, consequently, the two hold together better and form a harder surface. Zinc white, however, has comparatively little body, and so by itself makes but a poor covering material; but when mixed in judicious quantity with pure white lead they seem to add to each other some of their lacking qualities and form an excellent pigment.

Zinc white is the oxide of zinc, and is made either direct from zinc ore or from the metallic zinc. The ore or metal is heated to

a very high temperature in a retort, where there is maintained a blast of air; the zinc vaporizes, absorbs oxygen, and is distilled in a connecting chamber, forming as a white crustation or precipitate, and this is collected and thoroughly pulverized.

The finest zinc white is French zinc, which is made only from the metal; but, as I understand it, this name has about come to be merely a trade term in this country, where "French zinc" is now extensively manufactured, comparatively little being imported.

Zinc white used alone, besides having a tendency to shrink as it dries, becomes very hard and brittle and will not expand with the material over which it is painted, and this, in time, causes it to crack and check, so that where there is much change in the temperature or humidity of the atmosphere, zinc white used alone will not wear well and it is advisable to add something to give it elasticity.

Zinc white, contrary to white lead, is insoluble in water and so, of course, will not mix with it.

Zinc white is not fusible, and under the blowpipe is not materially affected, but will be gradually blown away as a dust.

Lately I have had brought to my attention a comparatively new pigment, recommended for all kinds of metalwork. It comes very strongly indorsed, and may possibly be able to realize all the claims made for it by its manufacturers.

This paint is called Superior Graphite, and the pigment is mined in Michigan. Graphite paints are not new, and those made from foliated graphite have not met with great success, as the very peculiarities that make this graphite valuable as a lubricant, for which it is extensively used, make it very undesirable as a pigment. This defect has been partially overcome by the addition of other substances, but foliated graphite paints have even then, as a rule, proved unsatisfactory. With this new graphite, called amorphous, as having no regular formation contrary to the foliated, there is naturally a sufficiency of other, said to be, inert mineral substances to correct the greasy or slippery character of the material, and the manufacturers, as well as some of their indorsers, claim that a natural and ideal pigment for metal painting has at last been found; in short, that the Creator made this material for this particular purpose, and, of course, knew what he was about, so probably we can make no mistake in specifying it. It is claimed to be absolutely inert — uniting only mechanically with linseed oil — and that it contains no sulphur or other injurious elements.

Many painters are inclined to think "any old thing" is good enough for priming, though it stands to reason that for wear this is the most important coat, just as on the foundation of the house depends the stability of the building.

A priming coat on wood or other porous material should fill the pores, and to do this the pigment must be extremely fine in order to follow the oil as it soaks in, and all the materials of this coat should be of a lasting character.

Finely ground white lead or finely ground Rochelle or Oxford ocher — not ordinary yellow ocher, which is principally barites or some such worthless stuff — mixed with pure linseed oil, form probably the best priming coat for wood, and the priming coat should, if possible, be applied before the woodwork leaves the mill. The usual method of priming at the building, as this generally has to be done under very unfavorable conditions, is often to blame for the failure of the painting.

This paper has stretched out now beyond all pardonable length, else I would speak of several of the other special paints on the market and also of the color pigments, but it is to be hoped that some of the succeeding Chapter papers will deal with these interesting branches of the subject.

A NOTABLE GOLD MEDAL AWARD.

FOR the first time in its history the council of the Institution of Civil Engineers of England has awarded the Telford medal and a premium to an engineer for a paper upon architectural engineering. The Telford medal was established by the founder of the Institution of Civil Engineers and is given to others as well as members for distinguished work in the lines of civil engineering. As its membership is not confined to England, several engineers in this country, notably Mr. Cottrell, of New York, have already received this high reward of merit from this society. The present recipient, Mr. Edward Clapp Shankland, of the firm of D. H. Burnham & Co., architects, of Chicago, Illinois, presented a paper upon steel skeleton construction (an abstract of which is printed on pages 56-58). Mr. Shankland, though a young man, has won distinction through the successful designing of the steel work in many important structures, among which the Liberal Arts or Manufactures building at the Columbian Exposition is the most notable. The span of this great building was 368 feet and the height 206 feet, while the trusses of his Machinery Hall of the same exposition, with a span of 155½ feet and a height of 77½ feet, and the roof of the First Regiment Armory at Chicago, span 115 feet and rise 93 feet, are also remarkable examples of architectural engineering. The engineering of the many "skyscrapers" designed by this firm during the past eight years is also the work of Mr. Shankland, so that it was not surprising that the perfect knowledge and great ability shown by him in his brief paper should have awakened the enthusiasm and generous approval of this great engineering society. The medal is of gold, 2½ inches in diameter, the face and reverse of which presents one of the finest examples of the engraver's art shown on any similar work of modern times. The premium was a complete set of instruments, silver mounted and inclosed in a rosewood box.

While the receipt of this mark of approval from the most authoritative body of engineers in the world is a matter for congratulation, the real evidence of Mr. Shankland's great ability as an engineer lies in his successful solution of the difficult engineering problems which surround that form of construction called skeleton and in which his foundations involve especially notable problems. These he has in every case so successfully met that his ability places him first in the list of engineers, small though it is, that really can be trusted with this class of engineering design, no matter what their training or reputation in other branches may have been.

PROGRAMME OF UNIVERSITY OF CALIFORNIA COMPETITION.

THE trustees, appointed by Mrs. Phebe A. Hearst, hereby invite the coöperation of the architects of the world in the preparation of a permanent, general plan of the buildings and grounds which are to compose the University of California, in Berkeley (near San Francisco), California.

J. B. Reinstein, James H. Budd and William Carey Jones, as trustees appointed by Mrs. Phebe A. Hearst for the obtainment of an architectural plan of the buildings and grounds for the University of California, have deposited with the London, Paris and American Bank, Limited, at San Francisco, California, securities of the value of $50,000, as a fund to guarantee the performance by said trustees of all their promises and covenants contained in the programme for an international competition for the obtainment of such plan, which programme is dated December 3, 1897.

The said fund of $50,000 to be paid over and delivered only upon the order of said trustees or a majority thereof, and their successors in interest.

The competition will be double, i. e., preliminary and final.

RULES OF PRELIMINARY COMPETITION.

ARTICLE 1. The architects of all countries are invited to participate.

ART. 2. The University of California intrusts the distribution of this programme and of the other documents and materials necessary for the competitors, as follows:

Argentine Republic.— Minister of Foreign Affairs, Buenos Ayres.

Austria-Hungary.— Architecten-Club, Künstler-Haus, No. 9 Lothringer Strasse, Vienna. Magyar Merñök és Epitész, Egyesület ker Ujvilagutcza 2, Budapest IV, Hungary.

Belgium.— Société Centrale d'Architecture de Belgique, Palais de la Bourse, Rue de Midi, Brussels.

Brazil.— Minister of Foreign Affairs, Rio de Janeiro.

Canada.— Mr. A. T. Taylor, Secretary R. I. B. A., 43 St. François Xavier street, Montreal.

Chile.—Minister of Foreign Affairs, Santiago.

China.— Minister of Foreign Affairs, Pekin.

Denmark.— Dansk Architekt Forening, Nybrogade 26, Copenhagen.

France.— Société Centrale des Architectes Français, Boulevard Saint Germain 168, Paris.

Germany.— Münchner Architekten und Ingenieur-Verein, care of Herrn Kreisbaurath Richard Reverdy, No. 8 Weinstrasse, Munich.

Vereinigung Berliner Architecten, care of K. E. O. Fritsch, No. 21 Keith-Strasse, Berlin.

Great Britain and Colonies.— Royal Institute of British Architects, 9 Conduit street, Hanover Square, London, W.

Holland.— Société Architectura et Amicitia, care of K. de Bazel, Architecte, 118 Nicolaas Beetsstraat, Amsterdam.

Italy.— Cultori di Architettura, Via de Burro, 151, Rome. Collegio degli Ingregneri ed Architetti, No. 1 Via Cernaia, Milan.

Japan.— Minister of Foreign Affairs, Tokio.

Mexico.— Señor Ingo. Don M. Fernandez Leal, Presidente de la Asociacion de Ingenieros y Arquitectos, City of Mexico.

Norway.— Norske Ingeniör Arkitektsforening, Christiania.

Portugal.— Real Associaçao dos Architectos Civis e Archeologós Portuguezes, Lisbon.

Roumania.— Societatea Technica, Calea Victorier, Bucharest, Roumania.

Russia.— Société Imperiale des Architectes de St. Petersbourgh, Cercle des Architectes de Moscou, Moscow.

Spain.— Real Academia de San Fernando, Madrid.

Sweden. — Svenska Teknologföreningen, Stockholm.

Switzerland.— Société Suisse des Architectes et Ingenieurs, care of M. Geiser, Zürich.

Turkey.—Son Excellence le Ministre de l'Instruction Publique et des Beaux Arts, Constantinople.

United States of America.—Chapters of American Institute of Architects, Boston, Brooklyn, Buffalo, Chicago, Cincinnati, Cleveland, Denver, Detroit, Indianapolis, Kansas City, Los Angeles, Lynchburg, Va., New York, Philadelphia, Pittsburg, Providence, Rochester, San Francisco, Seattle, St. Louis, Washington, and the mayors of the other principal cities.

ART. 3. In order to assure to all competitors the same period of time, a sealed parcel containing copies of the programme, plans of the ground, and other materials, will be deposited at each of the above named addresses.

These parcels will be opened, in the presence of possible competitors who may desire to attend, on January 15, 1898, at noon, at the various distributing points in Europe, and, in order to roughly equalize the time of all competitors, on January 5, 1898, at noon, at all other distributing points. From this day on, copies of the programme and maps will be handed or sent to all architects who may ask for them. The competition will be closed on July 1, 1898, at noon, as provided in Article 4.

ART. 4. Before this date (July 1, 1898), the plans must be deposited by the competitors with the United States Consul at Antwerp, Belgium. The date of receipt of each plan must be written in ink on the tube containing it, by said Consul.

All the plans will be inclosed (rolled) in an impermeable tube, sealed, bearing the printed address: "University of California, Phebe Hearst Architectural Plan," and each of such plans must bear on it a device or particular sign, identical in every respect with that which will be inclosed within a sealed envelope containing the name and address of its author, and hereinafter referred to.

Accompanying the plans, and securely fastened thereto, and inside of the tube above referred to, which shall be tightly sealed, are to be sent three envelopes, all three sealed:

Envelope No. 1, sealed, containing the name and address of the author, and a facsimile of the device upon his plan, superscribed: "Name and address of author and facsimile of device on plan," "To be opened only in case plan is accepted."

Envelope No. 2, sealed, containing envelope No. 1. This envelope No. 2 is also to bear upon it a facsimile of the device of the author, and is to be superscribed: "The name and address of the person to whom the plan is to be sent, if rejected, must be hereon inscribed," "To be opened only in case plan is accepted."

Envelope No. 3, sealed, containing envelope No. 2, and superscribed: "Competition for the University of California," "United States Consul, Antwerp, Belgium."

This envelope, containing envelope No. 2, is to be securely attached to the author's plan.

If the plans be rejected, envelope No. 2, unopened, is to be returned with the plans to the address indicated on envelope No. 2.

These envelopes will be distributed, with the other materials, by the Trustees.

ART. 5. The jury will be international.

For the preliminary competition it will be composed of five members, namely: Messrs. R. Norman Shaw, 6 Ellerdale road, Hampstead, London; J. L. Pascal, 8 Boulevard St. Denis, Paris; Paul Wallot, 6 Hähnel-Strasse, Dresden; Walter Cook, 674 Broadway, New York City; J. B. Reinstein, 217 Sansome street, San Francisco, California.

The members of the jury shall have no knowledge of the authorship of any plan, nor shall they counsel any competitor, nor take part in any way in this competition, except as members of the jury. In case of the inability of any juror to act as such, the remaining jurors shall select a juror to act in his place.

ART. 6. The preliminary competition will be decided at Antwerp, Belgium, and will not be preceded or followed by any public exhibition whatever.

The retained plans will not be classified; the jury will proceed by elimination.

The decisions of the jury will be without appeal. The grounds for their decision will not be given.

Judgment will be passed simultaneously on all the plans.

ART. 7. The maximum number of plans to be retained is not settled in advance. The jury will retain all the plans which it shall deem worthy of being kept, but at least ten.

The plans retained from the preliminary competition will become the property of the University of California.

The name of a successful author will not be published without his consent.

ART. 8. The authors of plans retained will receive a premium of $1,500 each, if only ten plans are retained; not less than $1,200 each, if not exceeding fifteen plans are retained; and not less than $1,000 each, if more than fifteen plans are retained, all payments being conditioned on the next Article.

ART. 9. The above stated premiums will be paid to the authors of the retained plans as follows:

1. A third within the month following the judgment.
2. Two-thirds after the execution and delivery of the final plan.

Consequently, the author of a retained plan, who may not enter the final competition, will be entitled to only one-third of the premium; the balance due him shall be forfeited to the trustees.

ART. 10. The rejected plans will be returned with the sealed envelope containing the name of the author, to the person designated on envelope No. 2 (Article 4), charges prepaid.

RULES OF THE FINAL COMPETITION.

ART. 11. None but the competitors whose preliminary plans have been retained by the jury of the preliminary competition will be allowed to take part in the final competition.

They will be notified individually, by registered letter, of their admission to this second competition.

ART. 12. Although the programme of the final competition is, in the main, determined, and the competitors in the preliminary competition are hereby apprised of it, still the jury of the preliminary competition will have the right to make alterations in the programme for the final competition. The jury will request suggestions and ideas in this connection from the architects taking part in the final competition.

The letter of notification will inform them as to whether the programme has been modified or not, and, if it has, will state the nature of the modifications.

ART. 13. Competitors successful in the preliminary competition, wishing to study the site of the proposed buildings on the ground, will receive first-class transportation and expenses for the journey from their places of residence to San Francisco and return.

They should be provided with credentials, so that they may be identified in San Francisco.

The competitors shall, within the fortnight following the reception of the letter of notification prescribed in Article 11, state whether they intend going to San Francisco, and at what time, by a letter addressed to the trustees.

ART. 14. Competitors successful in the preliminary competition will have not less than six months after the decision in the preliminary competition, within which to send in their plans for the final competition.

The letter of notification which the competitors will receive (see Article 11) will specify the date on which the plans should be deposited.

The same conditions regulating the transmission of plans for the preliminary competition will be applied in the transmission of the plans for the final competition, except that all such plans must be sent to the secretary of the University of California, at Berkeley, California, and that the envelope No. 1, inclosing the name and address of the author and the facsimile of the device on his plan, must contain also such references, certificates and data as will indicate the ability of the competitor for the execution of the work and the carrying out of his plan.

ART. 15. The plans are to be designated by devices or distinctive signs, reproduced on the envelope No. 2 joined to the plans sent; but the competitors must not use the same devices as those used by them for the preliminary competition.

ART. 16. The jury of the final competition will be composed of:

1. The five members of the jury of the preliminary competition.
2. Of four architects who will be chosen by the trustees of the Phebe Hearst Architectural Plan, aided by lists of names proposed by the competitors successful in the preliminary competition.

To that end, every such competitor will, on receipt of the registered letter of notification (Article 11), send to the trustees, under a sealed envelope, a list of five names of architects.

After counting these votes, the above trustees will decide on the names of the four additional jurors (having previously ascertained their acceptance), never losing sight of the international character which this jury must preserve. In case of the inability of any juror to act as such, the remaining jurors shall select a juror to act in his place.

ART. 17. The preliminary plans retained, and those presented at the final competition, will be exhibited publicly at the Mark Hopkins Institute of Art, in San Francisco, California.

In order, furthermore, to secure for the contestants, as much as possible, publicity of the competition, all the plans will be photographed on the same reduced scale.

A series of these photographs will be forwarded to each of the societies of architects mentioned in Article 2, with a request to give them a public exhibition.

Every author will receive, personally, two proofs of the photographs of all these plans.

ART. 18. It is to be understood that competitors will have full liberty either to preserve or to modify the composition which they will have presented at the preliminary competition.

ART 19. A total sum of at least $20,000 will be devoted to premiums for the best plans. At least $8,000 of this sum will be awarded to the plan classed as No. 1.

At least five of the plans will be awarded a premium.

But the jury retains the right of distributing the total allotment of money among a greater number of plans, taking into consideration the number and merit of the compositions submitted to its examination.

Consequently, the jury will first decide upon the amount of the second premium, then of the third, and so on, until the sum total of at least $20,000, as stipulated above, is reached. After this has been done, the premiums will be awarded by a secret ballot, calling for an absolute majority.

Should it happen that two candidates receive the same number of votes for a particular premium, the premium voted upon, and the next in order, will be added together, and their sum total divided evenly between the two candidates.

If this parity should happen for the last premium, this will be divided evenly between the two candidates.

ART. 20. After the vote described in Article 19, the envelopes will be opened and the successful competitors announced.

ART. 21. The jury will designate its president, vice-president, secretary and recording secretary.

A record will be kept of all the proceedings.

ART. 22. The recording secretary will prepare a report, which must be signed by the jury and submitted to the trustees, and which will state the reasons for the judgment rendered, the jury's estimates of the merits of the rewarded plans, together with suggestions and advice as they may deem useful in the ultimate construction of the buildings.

ART. 23. The University of California reserves for itself the right of entire control and direction in the matter of the execution of the work.

The rewarded plans will become its property, and it will be at liberty to select therefrom any idea that it may desire.

The jury, however, after taking into consideration the value of the plan, as well as the references and certificates that the competitors will have inclosed in the envelope containing their names, will declare whether the architect, author of the plan classed as No. 1, seems to offer the guarantees which would justify his being intrusted with the execution of the earlier work to be undertaken.

The jury may extend its opinion so as to show, in like manner, its appreciation of the other rewarded plans.

ART. 24. Should the University wish to confide the direction of the work to the author of the first-prized plan, or, if he decline, to one of the architects having received a premium, a contract for the direction of the work will be drawn between the University and the architect, conditioned upon the suggestions and advice of the jury; it being well understood that, if such a contract is made, it will be a desirable consequence of the competition, but in nowise a condition thereof.

ART. 25. The unrewarded plans will be returned according to the stipulations in reference to the rejected plans of the preliminary competition.

ART. 26. The jury's decisions will be without appeal. The fact of a candidate taking part in the competition implies his acceptance of all the conditions of the present specifications and programme.

ART. 27. The cost of distribution of the premiums, of exhibitions, judgments, delivery of the programme and materials, and all expenses other than those for the preparation and submission of the plans, will be incurred by the trustees of the Phebe Hearst Architectural Plan.

ART. 28. The report of the jury's proceedings will be published in the cities of the societies mentioned in Article 2.

The name of a competitor will not be published without his consent.

AN INTERESTING COMPETITION.

THE American Luxfer Prism Company have organized a competition among architects and draftsmen that presents many interesting features. The remarkable lighting effects obtained by their method of prismatic radiation has established an innovation similar to the advent of the elevator in changing the designs of buildings and in increasing their available space. Now architects are called upon to show in a competition in which liberal premiums are paid, how the prismatic light can be further utilized, and also united with architectural effects. The company's proposition is as follows:

PROGRAMME.

The American Luxfer Prism Company desires from the architects of America competitive designs setting forth in a definite and comprehensive manner new possibilities in the use of Luxfer prisms as a building material, considered from the standpoint of the owner's interest, as well as that of good modern architecture. The nature of these designs should be both practical and artistic, and will be judged on that basis. For designs submitted in accordance with the foregoing the following awards are offered:

For the design of greatest merit	$2,000
" " " second in merit	1,000
" " " third " "	500
" " " fourth " "	300
" " " fifth " "	200
" " ten designs next in point of merit, each	100

No limitations are imposed as to the size or character of drawings to be submitted. The designs awarded prizes are to become the property of the company without further compensation to the designer. All rights to any patentable features shall be transferred to the company upon the payment to the designer of $50 for each patent secured.

The "Luxfer Prism Handbook" contains a general survey of the work which has been done up to the present time, together with the scientific information necessary to a thorough understanding of the subject. All designs considered will be those which are accompanied by practical prescriptions for the proper use of the particular kind and quantity of prisms contemplated by

the designer, and in accordance with the tables and data furnished in this book.

The accompanying studies are suggestions for the use of Luxfer prisms in connection with the steel frame of commercial buildings. No design or specification comprehended therein or in the handbook will be adjudged "new."

The awards will be made March 21, 1898, by a jury of well-known architects and experts, the names of whom will be announced later.

Drawings must be received at the general offices of the American Luxfer Prism Company, The Rookery, Chicago, not later than March 15, 1898, and shall bear no mark of identification whatever. A separate, sealed inclosure containing the name and address of the competitor must be attached to the drawing, to be opened after the award is made. The marks of identification will be made by the committee.

The high standing of the officers and directors of this company insures the utmost fairness in the adjudication of the competition, and aside from the liberal prizes awarded, the artistic use of prismatic lights will be greatly advanced and their practical value increased.

THIRD GOVERNMENT COMPETITION.

THE competition for a Government building at Camden, New Jersey, has been arranged by the Supervising Architect. The judges are Supervising Architect Taylor and Architects Alfred Stone, of Providence, and W. Martin Aiken, of Cincinnati. The competitors invited are Theopilus P. Chandler, John Fraser, Rankin & Kellogg, Edwin V. Seeler, Totten & Rogers, Arthur Troscott, and Wilson Brothers & Company, all of Philadelphia. The cost will be $168,000, and the date of closing the competition, March 1, 1898.

OUR ILLUSTRATIONS.

Business Building, Philadelphia.

Residence, Cincinnati. Elzner & Anderson, architects.

Brewery, Munich, Germany. Heilmann & Littmann, architects.

Detail of Residence, Berlin, Germany. Solf & Wichards, architects.

Residence for T. D. Jones, Cincinnati. Des Jardins & Hayward, architects.

Store Building for Flint & Kent, Buffalo, New York. E. A. Kent, architect.

Residence for I. S. Deutsch, Cincinnati, Ohio. Des Jardins & Hayward, architects.

Pueblo Station, Interoceanic Railway of Mexico. W. T. Ingram, chief engineer; J. E. Campbell, architect.

Chicago Public Library. Shepley, Rutan & Coolidge, Architects. Four photogravure and sixty-five half-tone illustrations.

First Church of Christ (Scientist), Chicago. S. S. Beman, architect. The following views are given: Auditorium, lower vestibule, reader's desk and platform.

Study for Luxfer Prism Building—Design No. 2. This suggestion is in the nature of an emphasis of the vertical members of the steel frame, knit together at the top and at the bottom. The usual attempt at florid "topping out" has been dispensed with, and a simple rich frame of terra cotta completes the structure within itself. The upper portion of each bay is filled with a surface of Luxfer iridian prisms. The lower portion, which is shaded dark, is filled with plate glass. This treatment provides a continuous frieze of Luxfer prisms in the upper part of each story. The first and second stories are provided with canopies swung from the top of ornate posts or columns beginning at the second floor level. These columns also carry electric lights. The entire surface of the first and second story fronts, underneath the canopies, is of plate glass, showing the structural members behind.

Study for Luxfer Prism Building—Design No. 1. This suggestion is based upon a story height of eleven feet, and a divisional unit of eleven feet in plan. No attempt at structural elaboration has been made, but the steel frame quietly and consistently covered with terra cotta. The openings are simply *covered* with rich screens of Luxfer iridian prisms set in slightly projecting frames of ornamental iron. In general surface and effect these are similar to the forilux installed in the second story of the Home Insurance building, of Chicago, the offices of Armour & Co., and the Union National Bank. Openings with movable iron frames for ventilation and filled with plate glass are introduced in the middle of this richly bordered surface of prisms. The wall surfaces are preserved and enriched by this treatment, as the Luxfer iridian plates are as solid and substantial in appearance as the wall itself. The openings in the center of the plate which are here shown, about four feet square, are protected by a light canopy filled with prisms which permits a view of the street, and further increases the light. The structural members in the first and second stories are screened by the prism surfaces which are carried in front of them. The plate glass is retained in the lower part of the first story for show window purposes, and for the same reason a plate glass center is inserted in the second story forilux, also covered by a canopy.

United States Courthouse and Post Office Building, Norfolk, Virginia. Wyatt & Nolting, architects, Baltimore, Maryland. James Knox Taylor, supervising architect. As a result of the competition recently held by Secretary Gage, under authority of the Tarsney Act, Messrs. Wyatt & Nolting, of Baltimore, Maryland, have been appointed architects of the new Federal building to be erected at Norfolk, Virginia. The seven competitors were chosen on account of their prominence in the profession, and with regard to their location, as on the successful competitor devolves the local supervision of the work. The judges upon whose recommendation Mr. Gage decided the competition, were Mr. George B. Post, of New York, president of the American Institute of Architects; Daniel H. Burnham, of Chicago, ex-president of the same Society, and the Acting Supervising Architect of the Treasury Department. The site is a trapezium, which has a frontage on Plume street of 142 feet, 9½ inches, and on Atlantic street of 150 feet; the building will have a frontage of 92 feet on the former street, and 126 feet, 4 inches, on the latter. The main entrance, giving central access to the post office proper, will be situated on Plume street, and a secondary entrance on Atlantic street. The latter will also give entrance to the post office, but is intended particularly for direct approach to the elevator and stairs leading to the court room and offices above the first floor. The design is a dignified one, in the style of the Italian Renaissance; contemplating a basement of granite, a first story of either marble or light colored limestone, and second and third stories of buff colored brick, but with window jambs, corner quoins, etc., of the same material as in the first story. In the basement will be rooms for fuel, heating and ventilating apparatus, toilet room for the post office employes, and a lounging room for the letter carriers. The first floor will be given up entirely to the post office, the main portion being used as a working room, but there will also be rooms provided for the postmaster, assistant postmaster, money order and registry divisions, and the necessary vaults, toilet rooms, etc. The mailing platform, where all incoming mail is received and all outgoing mail is delivered, will be on the west side of the building, and be accessible from either Plume street or Atlantic street. On the second floor will be located the court room, with rooms for the judge, clerks of the court, district attorney, grand jury, and also toilet rooms, vaults, etc. The third floor will contain jury rooms, witness rooms, quarters for the marshal, toilet rooms, etc. Altogether the edifice will be a credit to the Government, to the architects—Wyatt & Nolting—and to the Supervising Architect of the Treasury Department, Mr. James Knox Taylor, who will represent the Treasury Department in all matters pertaining to the general arrangement, and to the financial side.

Photogravure Plate: Residence of Prof. George E. Vincent, Chicago. Howard Shaw, architect.

PHOTOGRAVURE PLATES.

Issued only with the Photogravure Edition.

Residence, Chicago.

Residences, Philadelphia. John Nottman, architect.

Residences for E. Baggot, Chicago. Wilson & Marshall, architects.

Residence for J. J. Wait, Chicago. Dwight Heald Perkins, architect.

First Church of Christ (Scientist), Chicago. S. S. Beman, architect, exterior.

Harrison Building, Philadelphia, Pennsylvania. Cope & Stewardson, architects.

Detail of Apartment House for John and B. F. McConnell, Chicago. George Beaumont, architect.

OBITUARY.

FRANK J. REID.

On December 21, last, Mr. Frank J. Reid, for many years the Eastern representative of THE INLAND ARCHITECT, died at Chicago at the age of fifty-six years. Mr. Reid was born in Dublin, Ireland, and coming to the United States as a young man settled in Chicago, where for a number of years he was identified with the real estate business, during the period following the great fire, with the firm of S. H. Kerfoot & Co. and others. He entered the field of newspaper work on one of the great dailies, and at the organization of the Inland Publishing Company became a valued assistant upon the work of upbuilding THE INLAND ARCHITECT. Mr. Reid was a man of exceptional gentleness of disposition and of fine honor, and in his business intercourse seldom failed to win the confidence and even friendship of those with whom his daily life brought him in contact. To the publishers of this journal his loss is personal, as his worth as a man was exceptional. His management of the Eastern field was faithful and efficient, and his death will be learned with regret by a large circle of friends throughout the Eastern cities. He was not married.

PERSONAL.

THE architects of Springfield, Massachusetts, have organized a club for the purpose of mutual improvement and benefit, with a view to influencing public improvements and interests. Those in attendance at the first meeting were Architects E. C. Gardner, Edwin J. Parlett, Guy Kirkham, B. Hammett Seabury, F. R. Richmond, Thomas O'Connell, G. Wood Taylor, George C. Gardner and George R. Pyne.

OCTAVIUS GRANT WOOD, whose articles on "English Workingmen's Homes" and "The Castles and Abbeys of England" in THE INLAND ARCHITECT attracted general attention, has assumed the management and assistant editorship of the *American Florist*, the leading horticultural journal in the United States. Mr. Wood is a young man with a brilliant future. His style is clear, concise and entertaining, showing a rare conception of the value of directness in composition.

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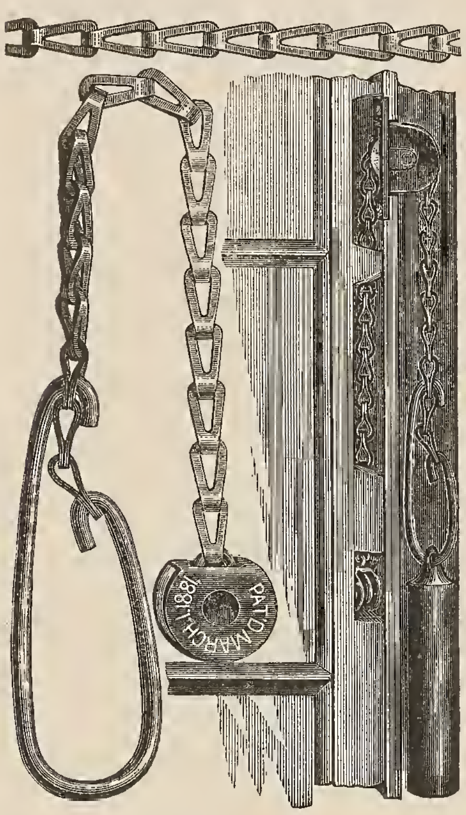

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THE INLAND ARCHITECT AND NEWS RECORD

Vol. XXX. ADVERTISERS' TRADE SUPPLEMENT. No. 6

FROM THE JOSEPH DIXON CRUCIBLE CO., JERSEY CITY, N. J.

In 1893 it was a case of business paralysis, in 1894 we had a year of debility, in 1895 the patient partially revived, in 1896 came a relapse, but in 1897 came recovery and the patient took up his bed and walked. The great medicine man was dollar wheat and thirty-cent corn, plus poor harvests at this exigency abroad. I saw it myself, for in November I visited Indianapolis, Cincinnati, Chicago, Omaha, Denver, Kansas City, Pueblo and St. Louis, and saw everyone up to his eyes in new business. The consumer at last had money once more, and was spending it. The industrial triumphs of 1897 are important. In this year the business cloud passed away, and another era of prosperity, hopefully of long duration, opened. Export trade was larger in the fruits of the harvest, and particularly in manufactured goods, than in the history of the country. Americans are competing in every market. American motors won the order in London. On a bridge in Holland an American firm was the lowest bidder. American steel rails go regularly to China Japan and India. A movement is on foot to have the English parliament pass a law changing the stamp on goods not made in England, stamped "Abroad" instead of the name of the country where they are made. This is an effort on the part of the English lawmakers to obscure the origin of these goods. For the Dixon Company, personally, we have shared in the general prosperity. The year has been an agreeable one, the future looks rosy to those who have eyes to see. Perhaps the outlook was never more inviting. Never were there so many roads open to wealth to those who know how to find them. Yours truly,

JOHN A. WALKER, Vice-President.

TRADE NOTES.

THE Flush Tank Company and Aurora Iron Works, Illinois corporations, doing business in Aurora, Illinois, have at duly authorized meetings of their stockholders, by unanimous vote of all stock represented, consolidated, and will in future transact business as the Flush Tank Company. The new company has a capital stock of $50,000, fully paid in; will pay the indebtedness, collect all outstanding accounts, and continue without interruption to carry on the business formerly conducted by the old companies. The Flush Tank Company respectfully solicits the patronage of all former customers of both companies.

THE Associated Expanded Metal Companies have issued the second number of their eight-page pamphlet descriptive of expanded metal. A number of half-tone engravings, taken from photographs of actual work, show what can be done in the way of ornamental plastering on expanded metal lath. The showing is certainly wonderful. In its various applications to the building art the use of expanded metal is now a distinct and separate system of fireproof construction, including, as it does, the metal lath, the solid plaster partition, and the concrete floor. Besides its fireproof qualities, this construction is said to be lighter and cheaper than other systems of fireproofing which possess no more advantages over the old style of building.

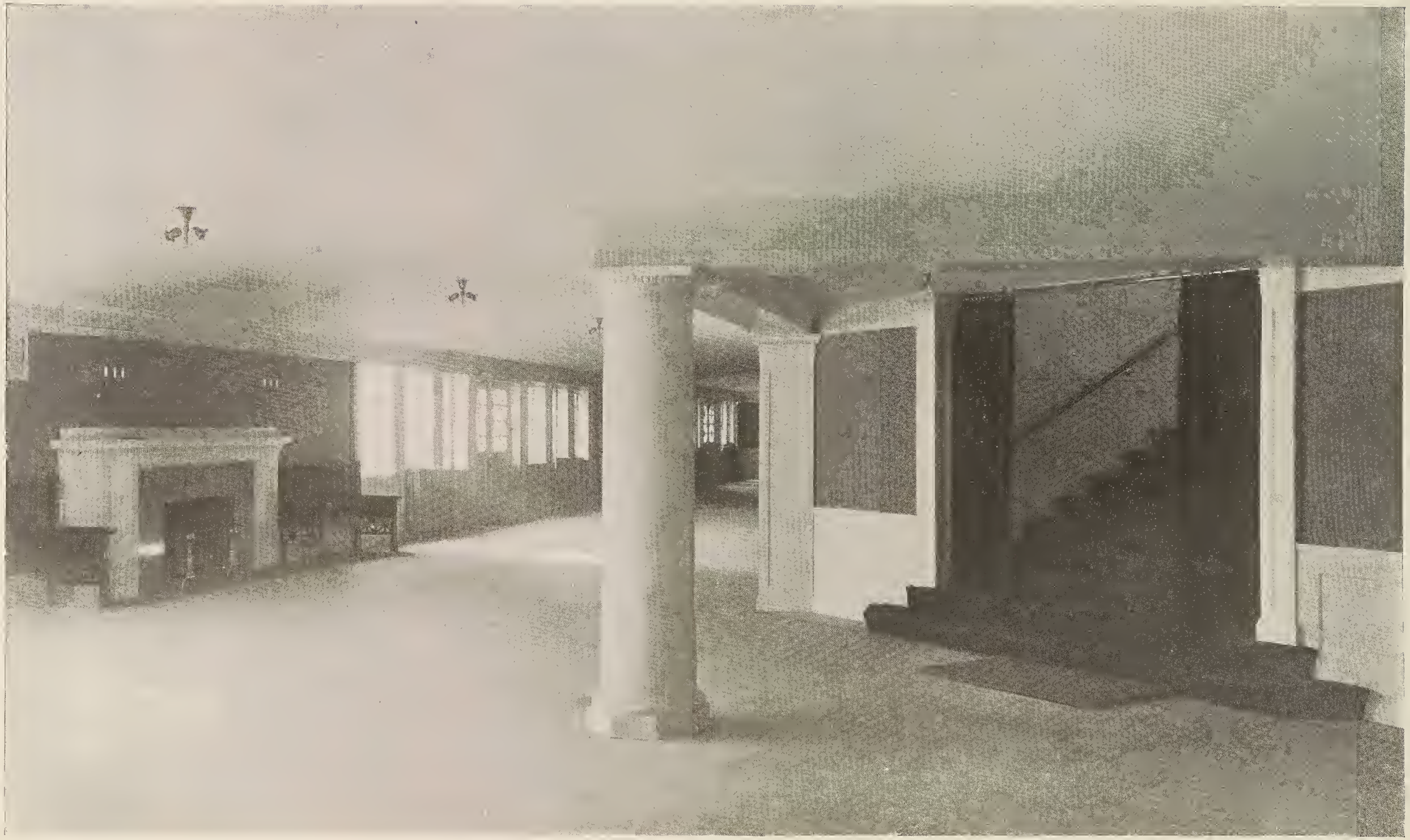
A CONTINUOUS and successful business career of almost forty years can be claimed by but few houses in the West. In January, 1860, Edwin Lee Brown founded the firm of Brown Brothers, afterward incorporated as Brown Brothers Manufacturing Company. In those early days of Chicago, sidewalk lights, or bull's-eye lights, as they were then called, were a new thing, untried and unknown, but in a few years the house had succeeded in building up a large and flourishing business. The importance of good work in the construction of sidewalk lights and skylights is probably underestimated by many, but the defects of the other kind become apparent in a very short time and continue a source of expense and annoyance. Careful and thorough work is assured in contracts undertaken by this house. Every variety of prismatic light work for sidewalks, floors and roofs is manufactured by this firm, and it is prepared to furnish special designs of mold glass and special patterns of iron framework for skylights from the plainest to the most ornate. Wrought-iron doors for sidewalk elevators, and chutes — coal hole covers and deck lights for vessels — are among the goods manufactured. The office and works of Brown Brothers Manufacturing Company are located at the northwest corner of Jackson boulevard and Clinton street.

REALLY fine hardware is absolutely essential to an elegant interior. Something more than mere finish, however, is here implied. Design is, perhaps, most important. Harmony is essential in design. The combination of appropriate and harmonious design with beauty of finish produces hardware which is a true work of art and is worthy of a place in the finest apartment. Such goods it has been the aim of the Norwalk Lock Company, of South Norwalk, Connecticut, to manufacture. Assuming that their new catalogue is fairly representative of their finished work, they have attained a high degree of success in this line. Their designs are in harmony with present architecture, and illustrate the higher grade of art as represented in both the modern and classical schools. The design in style of Louis XIII deserves special mention and is having a great run. Every variety of finish is made, including light bronze (natural color), light brown, chocolate matte (polished surface), sand blast, old brass (dark), old brass (light), antique brass (light), antique brass (dark), old copper, oxidized silver, gold plate, ebony and rustless iron. Special work, to conform to architects' specifications, can be executed on short notice in any metal and variety of finish. One feature of the Norwalk catalogue that is commendable is their quotations of prices of each article of manufacture, thereby saving to both dealer and customer the time that would otherwise be required to write for estimates.

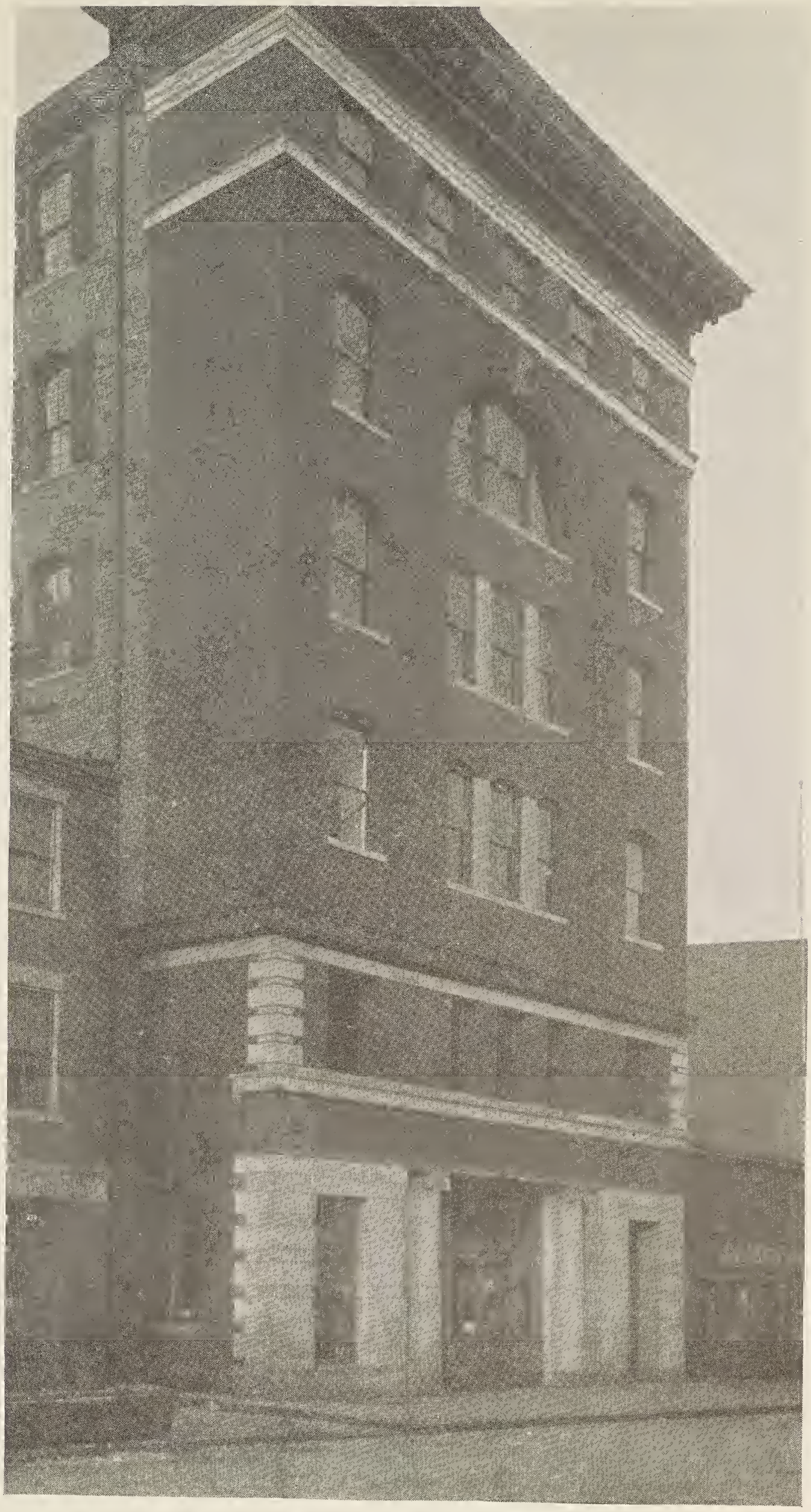
RAILROAD NOTES.

No. 4.— That's the number of the Michigan Central North Shore Limited train, leaving Chicago 12:30 noon and arriving in New York 1:30 P.M. next day (24 hours) and Boston 4 P.M. (26½ hours). If you want comfort on your journey east take this train. Because of the convenient hour of leaving, the business man is enabled to be at his office here in the morning and arrive at New York and Boston during business hours the next day. To ladies traveling alone is this train particularly recommended. Leaving as it does at midday, connections are made at junction points and New York for the New England States in ample time for one to reach her destination by daylight. City office, 119 Adams street, Chicago.

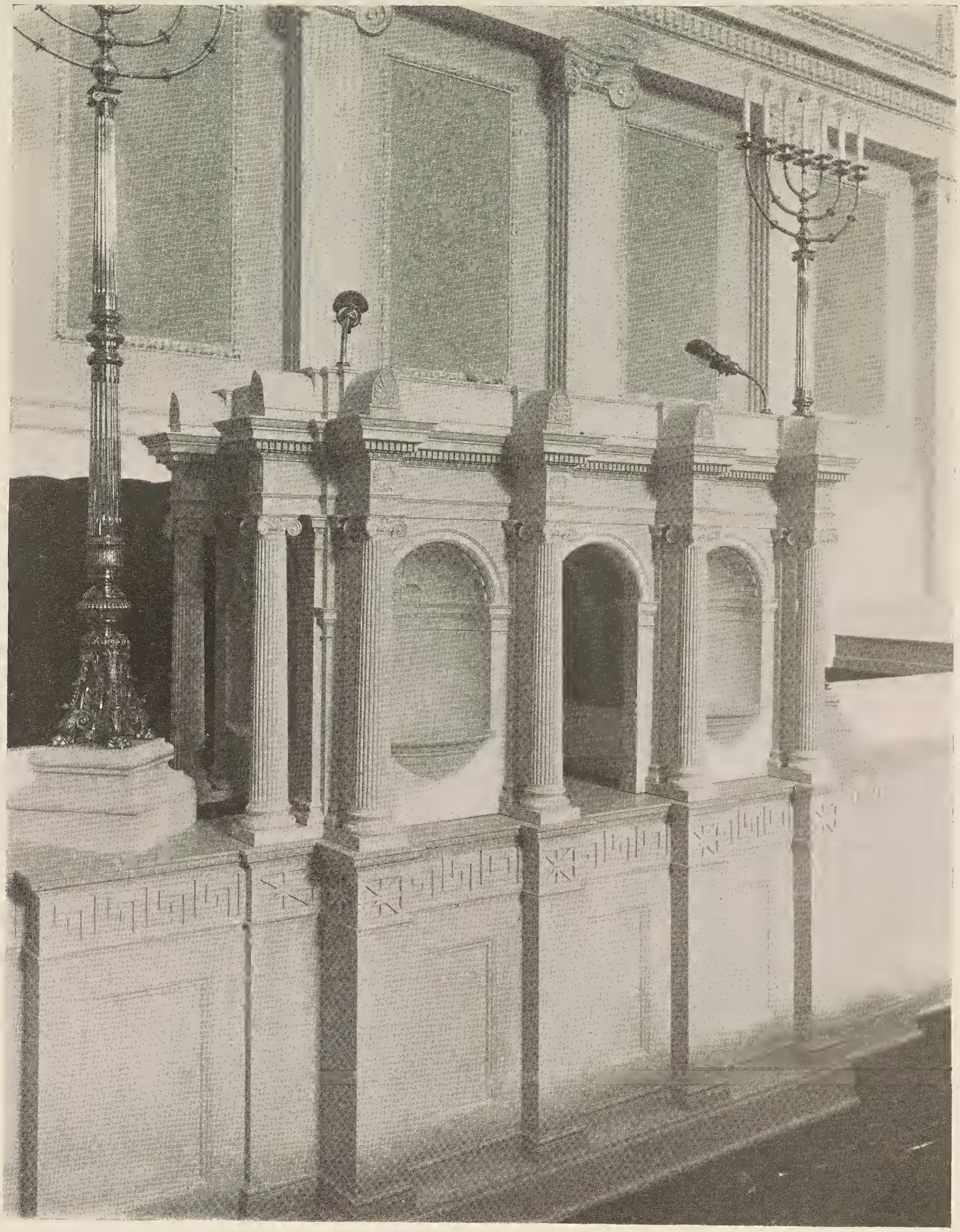
HOUSE AT NEWPORT, RHODE ISLAND. WM. R. EMERSON, Architect.



LOWER VESTIBULE.



BUSINESS BUILDING, PHILADELPHIA.



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S. S. Beman, Architect.


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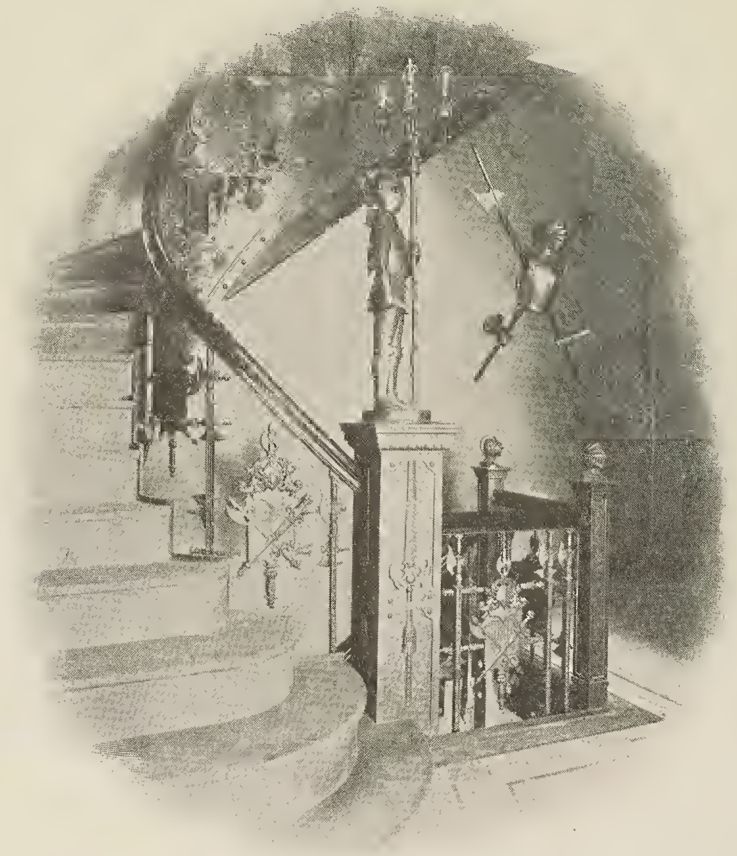
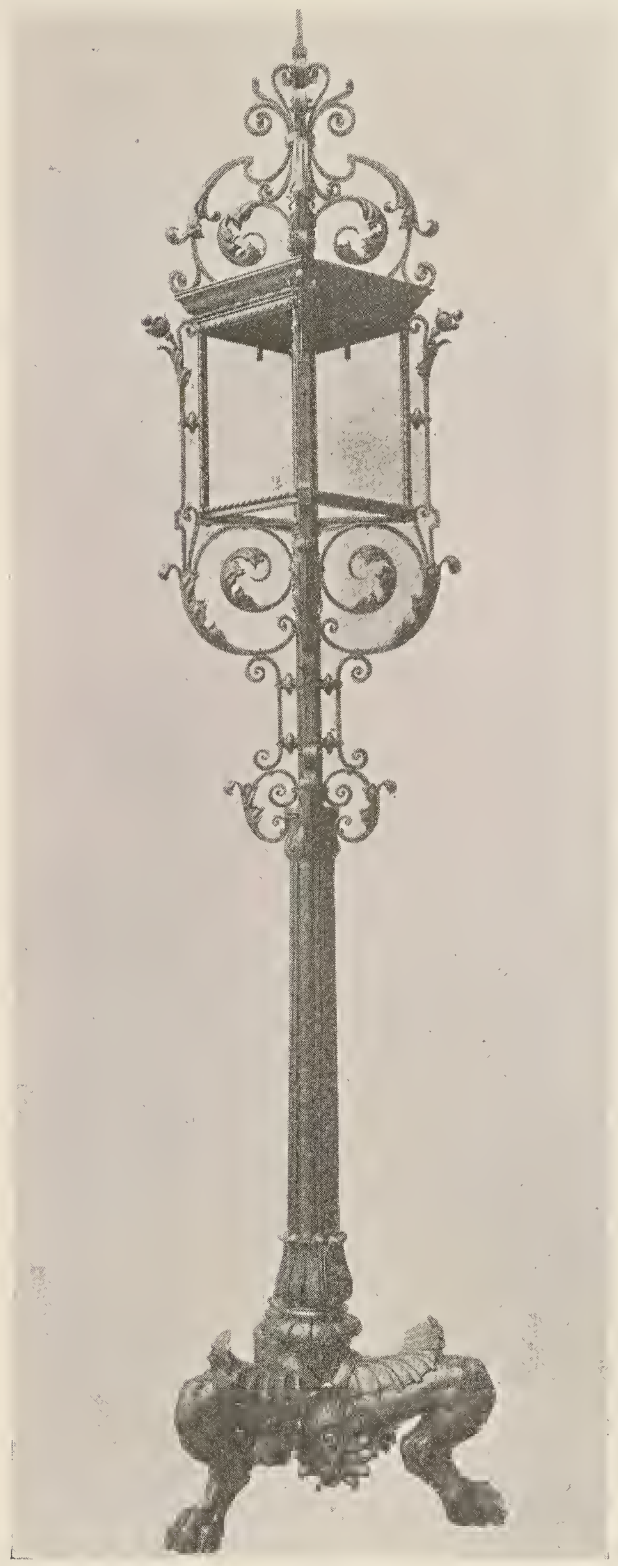
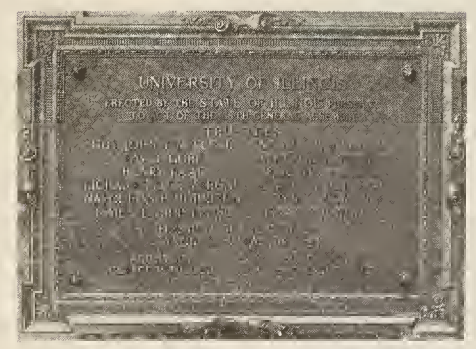
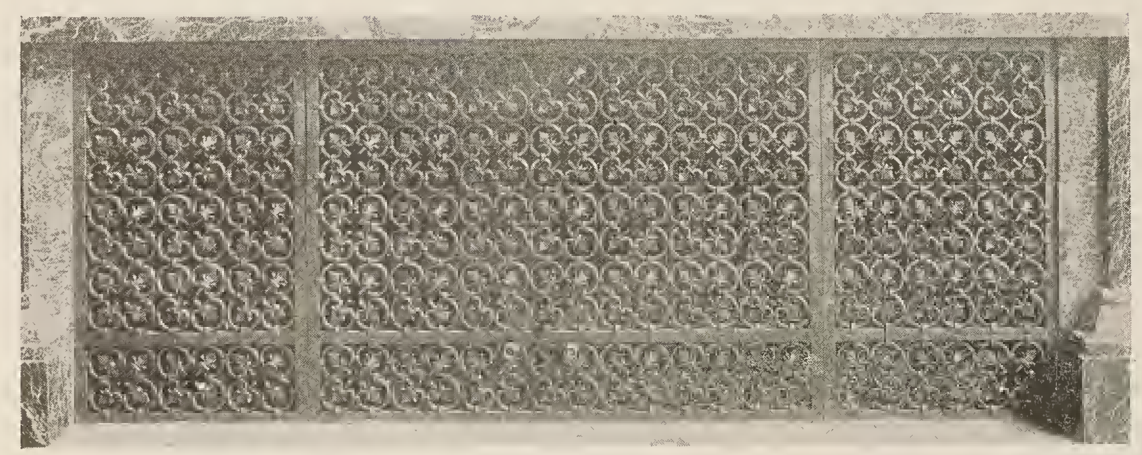

STAIRCASE, HADDON HALL, BOSTON, MASSACHUSETTS.

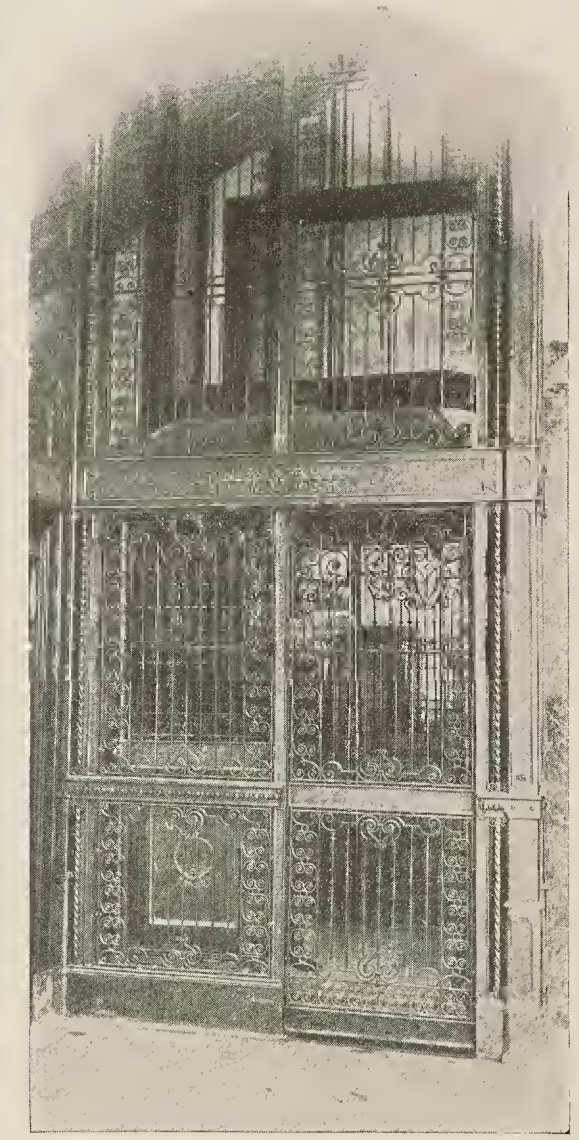

HAND-FORGED ELECTROLIER, PARLIAMENT BUILDINGS, VICTORIA, B. C.


HAND-FORGED LAMP AND STANDARD, CHICAGO HISTORICAL SOCIETY.


BALCONIES, STEINERT BUILDING, BOSTON, MASSACHUSETTS.


BRONZE TABLET.


HAND-FORGED GRILLE, CHICAGO PUBLIC LIBRARY.


ELEVATOR ENCLOSURE, SPRING VALLEY WATERWORKS, SAN FRANCISCO, CAL.


GRAND STAIRS, ELLICOTT SQUARE BUILDING, BUFFALO, N. Y.


HAND-FORGED ANDIRONS.

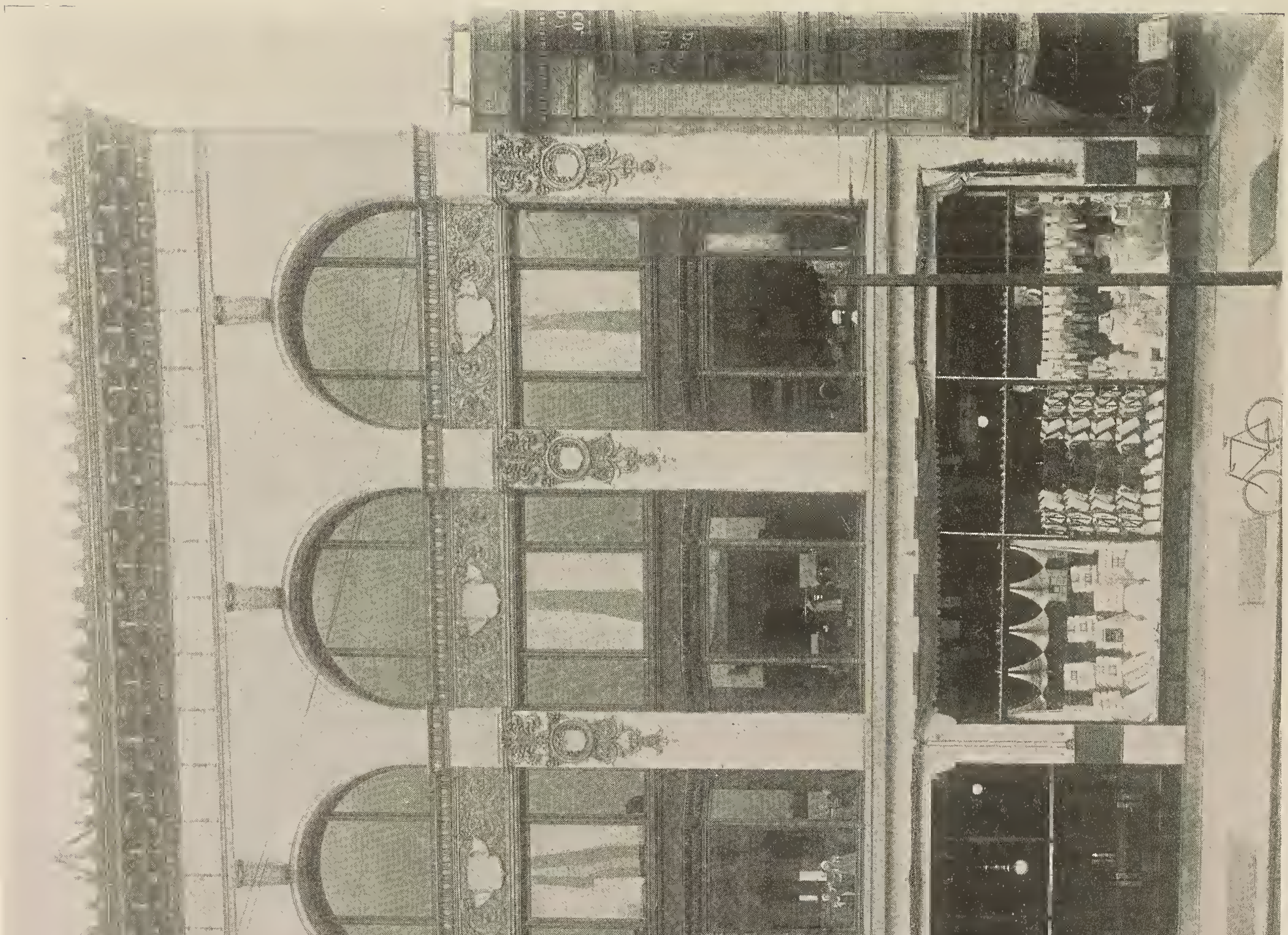

DRIVEWAY GATES, RESIDENCE OF MR. CLAUS SPRECKELS, SAN FRANCISCO, CAL.

RECENT EXAMPLES OF ORNAMENTAL IRON AND BRONZE WORK, EXECUTED BY THE WINSLOW BROS. COMPANY, CHICAGO.

INLAND ARCHITECT PRESS.

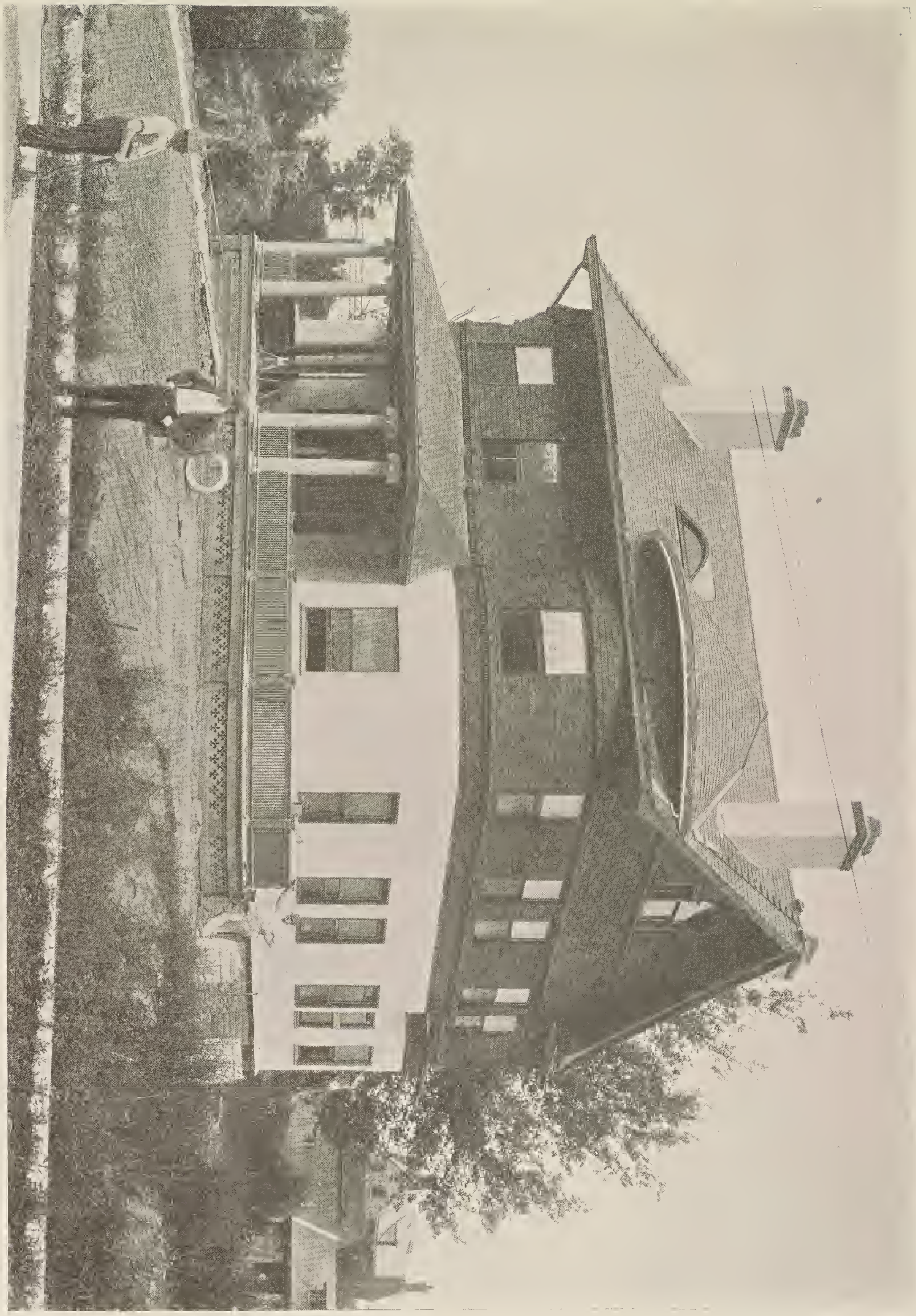
RESIDENCE OF PROF. GEO. E. VINCENT, CHICAGO.

HOWARD SHAW, ARCHITECT.



STORE BUILDING FOR FLINT & KENT, BUFFALO, N. Y.

E. A. KENT, ARCHITECT.



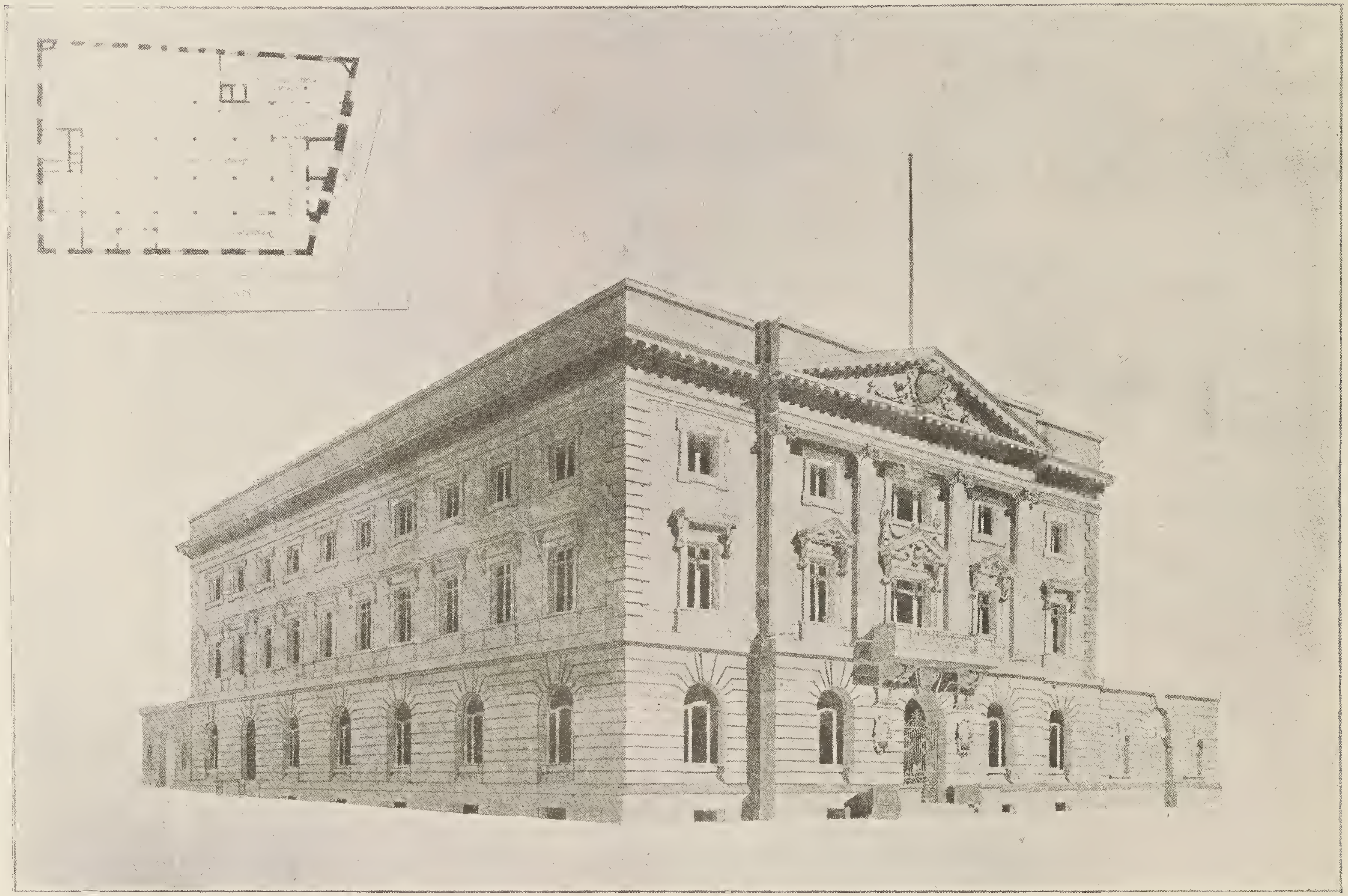
RESIDENCE, CINCINNATI, OHIO.

ELZNER & ANDERSON, ARCHITECTS.

AUDITORIUM.

FIRST CHURCH OF CHRIST (SCIENTIST), CHICAGO.

S. S. BEMAN, ARCHITECT.



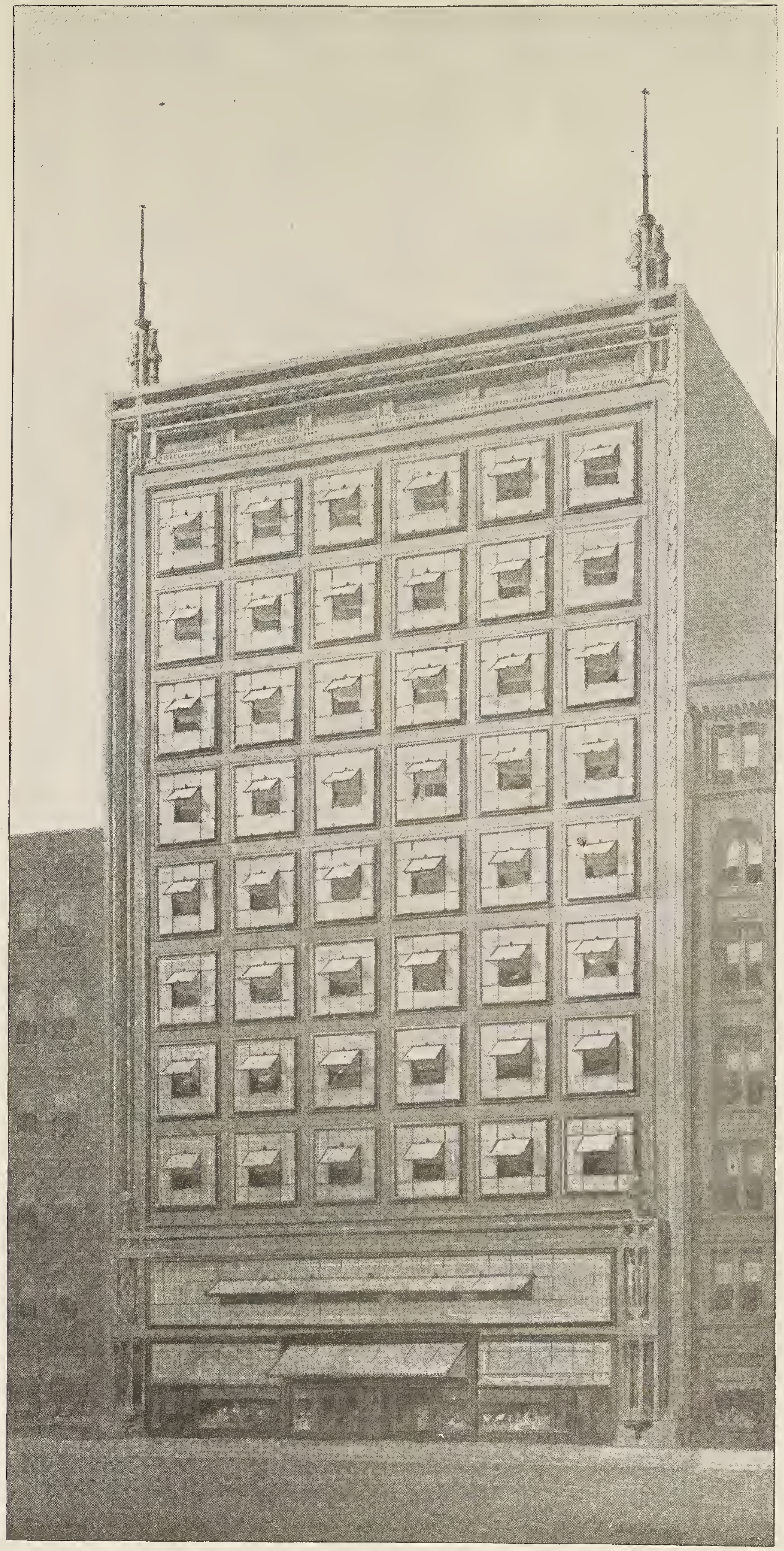
U. S. COURTHOUSE AND POST OFFICE, NORFOLK, VA.

Wyatt & Nolting, Architects, Baltimore, Md. James Knox Taylor, Supervising Architect.

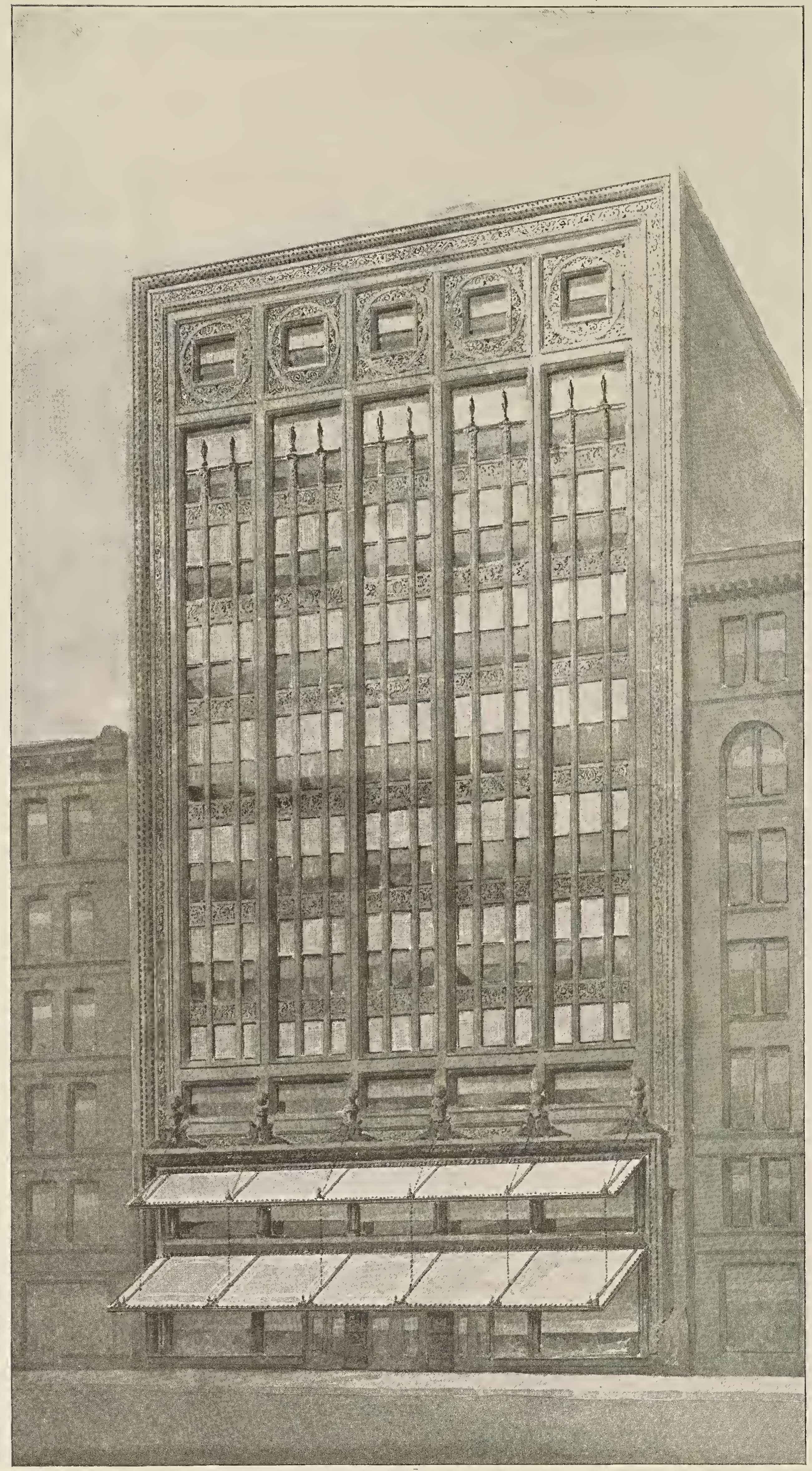
RESIDENCE FOR I. S. DEUTSCH, CINCINNATI, OHIO.

DesJardins & Hayward, Architects.

BREWERY, MUNICH, GERMANY.
HEILMANN & LITTMANN, ARCHITECTS.

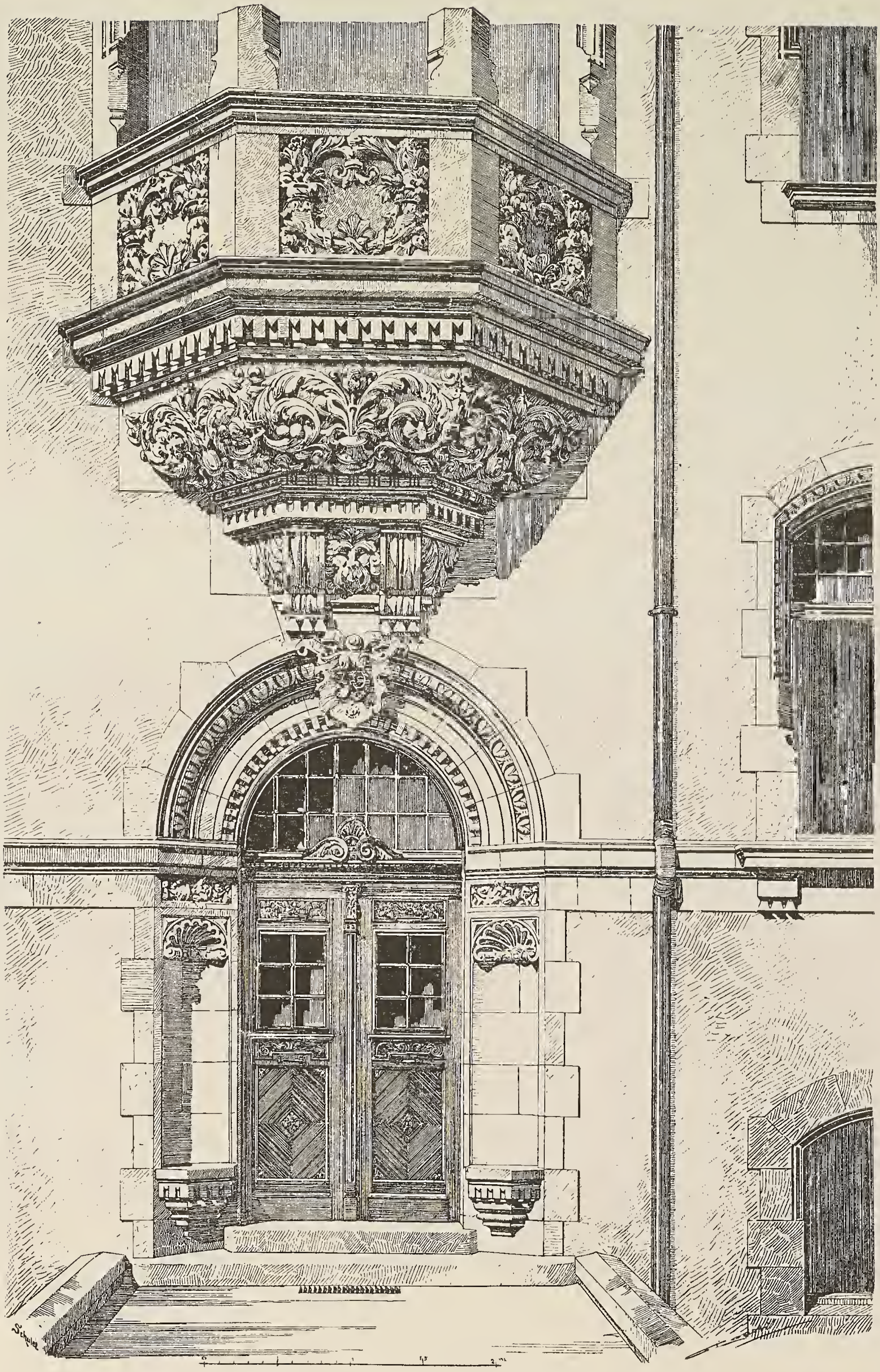


STUDY FOR LUXFER PRISM BUILDING DESIGN No. 1.



STUDY FOR LUXFER PRISM DESIGN No. 2.

See description of Luxfer Prism Competition on page 63 of this number.



DETAIL OF RESIDENCE, BERLIN, GERMANY.

SOLF & WICHARDS, ARCHITECTS.

RESIDENCE FOR T. D. JONES, CINCINNATI, OHIO.

DES JARDINS & HAYWARD, ARCHITECTS.

PUEBLA STATION, INTEROCEANIC RAILWAY OF MEXICO.

W. T. Ingram, Chief Engineer; J. E. Campbell, Architect.